



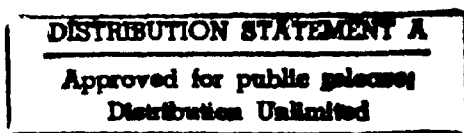
2

# FINAL REPORT

February 1990

EVT 12-90

## Transportation Test of "Fast Pallet" with Multiple Launch Rocket System (MLRS) and Projectile Loads



DTIC  
ELECTE  
JUN 04 1991  
S B D

UNLIMITED DISTRIBUTION

Prepared for:

Office of the Project Manager  
for Ammunition Logistics

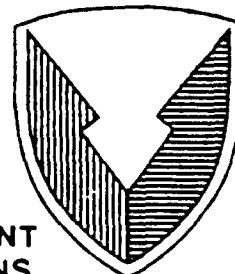
ATTN: AMCPM-AL

Picatinny Arsenal, NJ 07806-5000

91-00958



91 5 31 036



US ARMY  
ARMAMENT  
MUNITIONS  
CHEMICAL COMMAND

US ARMY DEFENSE AMMUNITION  
CENTER AND SCHOOL

EVALUATION DIVISION  
SAVANNA, ILLINOIS 61074-9639

### AVAILABILITY NOTICE

A complimentary copy of this report is furnished each attendee on automatic distribution. Additional copies or authority for reprinting may be obtained by written request from Director, U.S. Army Defense Ammunition Center and School, ATTN: SMCAC-DEV, Savanna, IL 61074-9639.

### DISTRIBUTION INSTRUCTIONS

Destroy this report when no longer needed. Do not return.

\* \* \*

Citation of trade names in this report does not constitute an official endorsement.

\* \* \*

The information contained herein will not be used for advertising purposes.

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE

## REPORT DOCUMENTATION PAGE

Form Approved  
OMB No. 0704-0188

1a. REPORT SECURITY CLASSIFICATION UNCLASSIFIED		1b. RESTRICTIVE MARKINGS	
2a. SECURITY CLASSIFICATION AUTHORITY		3. DISTRIBUTION / AVAILABILITY OF REPORT UNLIMITED	
2b. DECLASSIFICATION / DOWNGRADING SCHEDULE			
4. PERFORMING ORGANIZATION REPORT NUMBER(S) EVT 12-90		5. MONITORING ORGANIZATION REPORT NUMBER(S)	
6a. NAME OF PERFORMING ORGANIZATION U.S. Army Defense Ammunition Center and School	6b. OFFICE SYMBOL (If applicable) SMCAC-DEV	7a. NAME OF MONITORING ORGANIZATION	
6c. ADDRESS (City, State, and ZIP Code) ATTN: SMCAC-DEV Savanna, IL 61074-9639		7b. ADDRESS (City, State, and ZIP Code)	
8a. NAME OF FUNDING / SPONSORING ORGANIZATION Office of the Project Manager for Ammunition Logistics	8b. OFFICE SYMBOL (If applicable) AMCPM-AL	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER	
8c. ADDRESS (City, State, and ZIP Code) ATTN: AMCPM-AL Picatinny Arsenal, NJ 07806-5000		10. SOURCE OF FUNDING NUMBERS	
		PROGRAM ELEMENT NO.	PROJECT NO.
		TASK NO.	WORK UNIT ACCESSION NO.
11. TITLE (Include Security Classification) Transportation Test of "Fast Pallet" with Multiple Launch Rocket System (MLRS) and Projectile Loads			
12. PERSONAL AUTHOR(S) A. C. McIntosh, Jr.			
13a. TYPE OF REPORT FINAL	13b. TIME COVERED FROM _____ TO _____	14. DATE OF REPORT (Year, Month, Day) 1990 February	15. PAGE COUNT 41
16. SUPPLEMENTARY NOTATION			
17. COSATI CODES		18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)	
FIELD	GROUP	SUB-GROUP	
19. ABSTRACT (Continue on reverse if necessary and identify by block number)			
<p>The U.S. Army Defense Ammunition Center and School (USADACS), Evaluation Division (SMCAC-DEV), was tasked by the Office of the Project Manager for Ammunition Logistics (PM-AMMOLOG), AMCPM-AL, to test the 'Fast Pallet' for shipment of Multiple Launch Rocket System (MLRS) and future delivery of Army Tactical Missile System (ATACMS). The 'Fast Pallet', which is manufactured by Load and Roll, Inc., has been offered for service by EDI, Inc., and is being considered for more economical handling and transportation of ammunition in the Pacific. Two 'Fast Pallet' load configurations were tested in a standard International Standards Organization (ISO) container. The first pallet load consisted of four MLRS pods, restrained with 3-inch-wide web strapping. The second load consisted of 42 each pallets of 155mm projectiles to simulate the gross carrying capacity of the containerized unit. Both test loads were subjected to rail impact test, hazard course, panic stops, washboard course, and Shipboard Transportation Simulator (STS) tests.</p>			
20. DISTRIBUTION / AVAILABILITY OF ABSTRACT <input checked="" type="checkbox"/> UNCLASSIFIED/UNLIMITED <input type="checkbox"/> SAME AS RPT. <input type="checkbox"/> DTIC USERS		21. ABSTRACT SECURITY CLASSIFICATION UNCLASSIFIED	
22a. NAME OF RESPONSIBLE INDIVIDUAL THOMAS J. MICHELS, Chief, Evaluation Division		22b. TELEPHONE (Include Area Code) 815-273-8928	22c. OFFICE SYMBOL SMCAC-DEV

19. ABSTRACT (continued)

The MLRS load successfully passed all of the transportation tests. The 155mm load failed at the 8 miles per hour (mph) impact when the rear header assembly collapsed due to compressional forces of the shifting load. The proposed load procedure for 155mm projectiles is not acceptable for transportation of this item.

U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL  
 Evaluation Division  
 Savanna, IL 61074-9639

REPORT NO. EVT 12-90

TRANSPORTATION TEST OF "FAST PALLET"  
 WITH MULTIPLE LAUNCH ROCKET SYSTEM (MLRS)  
 AND PROJECTILE LOADS

TABLE OF CONTENTS

PART	PAGE NO.
1. INTRODUCTION.....	1-1
A. Background.....	1-1
B. Authority.....	1-1
C. Objective.....	1-1
D. Conclusions.....	1-2
E. Recommendations.....	1-2
2. ATTENDEES.....	2-1
3. TEST PROCEDURES.....	3-1
4. TEST RESULTS.....	4-1
5. TEST PLANS.....	5-1
6. PHOTOGRAPHS.....	6-1



Accession For	
NTIS GRA&I	<input checked="" type="checkbox"/>
DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification	
By	
Distribution/	
Availability Codes	
Dist	Avail and/or Special
A-1	

## PART 1

### INTRODUCTION

A. BACKGROUND. The U.S. Army Defense Ammunition Center and School, Evaluation Division (SMCAC-DEV), was tasked by PM-AMMOLOG, AMCPM-AL, to test the 'Fast Pallet' or Load and Roll Platform (LRP) for shipment of MLRS and future delivery of ATACMS. The 'Fast Pallet' which is manufactured by Load and Roll, Inc., has been offered for service by EDI Inc., and is being considered for more economical handling and transportation of ammunition in the Pacific. Two 'Fast Pallet' load configurations were tested in a standard ISO container. The first pallet load consisted of four MLRS pods, restrained with 3-inch-wide web strapping. The second load consisted of 42 each pallets of 155mm projectiles to simulate the gross carrying capacity of the containerized unit. Both test loads were subjected to rail impact test, hazard course, panic stops, washboard course, and STS tests. Blocking and bracing procedures were supplied by the Storage and Outloading Division (SMCAC-DEO). The loaded container and test 'Fast Pallet' were subjected to rail impact test, hazard course, road trip, panic stops, washboard course, and STS.

B. AUTHORITY. This test was conducted in accordance with mission responsibilities delegated by the U.S. Army Armament, Munitions and Chemical Command (AMCCOM), Rock Island, IL 61299-6000. Reference is made to Change 4, 4 October 1974, to AR-740-1, 23 April 1971, Storage and Supply Operations; AMCCOMR 10-17, 13 January 1986, Mission and Major Functions of U.S. Army Defense Ammunition Center and School.

C. OBJECTIVE. The objective of these tests was to determine if the 'Fast Pallet' unitized with two different test loads and shipped in an Intermodal

shipping container would be suitable in a road, ship, and rail transportation environment.

D. CONCLUSIONS. The Intermodal shipping container safely retained the inert load of MLRS/ATACMS unitized on a 'Fast Pallet' shipping pallet when subjected to rail, road, and STS tests. When the 'Fast Pallet' was configured with 42 pallets of 155mm inert ammunition, and reloaded into a standard ISO container, the unitization procedure failed to restrain the load during the rail transportation test. The 'Fast Pallet' remained intact.

E. RECOMMENDATIONS. It is recommended that the use of the 'Fast Pallet' in an ISO container be approved for the transportation of MLRS/ATACMS systems. It is further recommended that the outloading procedure developed for the 155mm ammunition be improved to support a 70,000- to 140,000-pound columnar compressive load and be retested.

PART 2

ATTENDEES

Mr. A. C. McIntosh  
Test Engineer  
AV 585-8989  
Comm 815-273-8989

Director  
U.S. Army Defense Ammunition Center  
and School  
ATTN: SMCAC-DEV  
Savanna, IL 61074-9639

Mr. Dave Valant  
Equipment Technician  
AV 585-8988  
Comm 815-273-8988

Director  
U.S. Army Defense Ammunition Center  
and School  
ATTN: SMCAC-DEV  
Savanna, IL 61074-9639

Mr. Greg Willis  
Industrial Engineer  
AV 585-8084  
Comm 815-273-8084

Director  
U.S. Army Defense Ammunition Center  
and School  
ATTN: SMCAC-DEO  
Savanna, Illinois 61074-9639

Mr. Edi Birsan  
Equipment Specialist  
Comm 415-232-6886  
FAX 415-232-9612

EDI Inc.  
860 Harbour Way So.  
Richmond, CA 94804

Mr. Jim Kisner  
Logistics Management Specialist  
AV 746-1773  
Comm 205-876-1773

Commandant  
U.S. Army Ordnance Missile and  
Munitions Center and School  
ATTN: ATSK-CMT-Z  
Redstone Arsenal, AL 35897-6095



## PART 3

### TEST PROCEDURES

A. RAIL IMPACT TEST. The test load or vehicle should be positioned in/on a railcar. For containers, the loaded container shall be positioned on a container chassis and securely locked in place using the twist locks at each corner. The container chassis shall be secured to a railcar. Equipment needed to perform the test includes the specimen (hammer) car, five empty railroad cars connected together to serve as the anvil, and a railroad locomotive. These anvil cars are positioned on a level section of track with air and hand brakes set and with the draft gear compressed. The locomotive unit pulls the specimen car several hundred yards away from the anvil cars and, then, pushes the specimen car toward the anvil at a predetermined speed, disconnects from the specimen car about 50 yards away from the anvil cars, and allows the specimen car to roll freely along the track until it strikes the anvil. This constitutes an impact. Impacting is accomplished at speeds of 4, 6, and 8 mph in one direction and at a speed of 8 mph in the opposite direction. The 4 and 6 mph impact speeds are approximate; the 8 mph speed is a minimum. Impact speeds are to be determined by using an electronic counter to measure the time required for the specimen car to traverse an 11-foot distance immediately prior to contact with the anvil cars.

B. HAZARD COURSE. The specimen being tested will be subjected to the road hazard course. Using a suitable truck/tractor or tactical vehicle, the vehicle/specimen of test method No. 1 shall be towed/driven over a hazard course two times at a speed of approximately 5 mph. The speed may be increased or decreased, as appropriate, to produce the most violent load response.

C. ROAD TRIP. Using a suitable truck/tractor and trailer, or tactical vehicle, the tactical vehicle/specimen load shall be driven/towed for a total

distance of at least 30 miles over a combination of roads surfaced with gravel, concrete, and asphalt. Test route shall include curves, corners, railroad crossings, cattle guards, stops, and starts. The test vehicle shall travel at the maximum speed suitable for the particular road being traversed, except as limited by legal restrictions. This step provides for the tactical vehicle/specimen load to be subjected to three full airbrake stops while traveling in the forward direction and one in the reverse direction. The first three stops are at 5, 10, and 15 mph, while the stop in the reverse direction is of approximately 5 mph.

D. WASHBOARD COURSE. Using a suitable truck/tractor, and/or tactical vehicle, the specimen shall be towed/driven over the washboard course at a speed which produces the most violent response in the particular test load (as indicated by the resonant frequency of the suspension system beneath the load).

E. SHIPBOARD TRANSPORTATION SIMULATOR. The test load (specimen) shall be positioned onto the STS and securely locked in place using the cam lock at each corner. Using the procedure detailed in the operating instruction, the STS shall be started oscillating at an amplitude of  $30^{\circ} \pm 2^{\circ}$ , either side of center and a frequency of 2 cycles-per-minute (30 seconds + 2 seconds total roll period). This frequency shall be maintained for at least 15 minutes during which time the load will be observed for apparent defects that could cause a safety hazard. The frequency of oscillation shall then be increased to 4 cycles-per-minute (15 seconds + 1 second roll period) and the apparatus operated for 2 hours. If an inspection of the load does not indicate an impending failure, the frequency of oscillation shall be further increased to 5 cycles-per-minute (12 seconds + 1 second cycle time), and the apparatus operated for 4 hours. The operation does not necessarily have to be continuous; however, no change or adjustments to the load or load restraints

shall be permitted at any time during the test. After once being set in place, the test load (specimen) shall not be removed from the apparatus until the test has been completed or is terminated.

PART 4

TEST RESULTS

## RAIL IMPACT DATA

TEST NO. 1

DATE: 6 FEBRUARY 1990

TEST SPECIMEN: Trailer-on-flatcar (TOFC), ISO container, LRP and MLRS pods.

TEST CAR NO.	TTX 153487	LT. WT.	73,400	pounds
CHASSIS NO.	5394	LT. WT.	6,040	pounds
CONTAINER NO.	INBU 2598901	LT. WT.	5,200	pounds
LRP NO.	EDIT 3007	LT. WT.	3,600	pounds
LADING AND DUNNAGE		WT.	20,000	pounds
	TOTAL SPECIMEN	WT.	108,240	pounds
	BUFFER CAR (5 CARS)	WT.	250,000	pounds

IMPACT NO.	END STRUCK	VELOCITY (MPH)	REMARKS
1	rear	4.21	no movement.
2	rear	6.47	LRP shifted forward 3/4 inch. Pallet chocks loose. Shim at end of container omitted.
3	rear	7.75	Velocity too slow. Impact recycled.
4	rear	8.33	LRP left side shifted 3/4 inch toward rear. Right side, 7/8 inch.
5	forward	8.33	Pallet moved back to base reference line.

ROAD TEST DATA

TEST NO. 2

DATE: 6 FEBRUARY 1990

TEST SPECIMEN: TOFC, ISO container, LRP and MLRS pods.

PASS 1-A OVER FIRST SERIES OF TIES: 0.10 MIN 5.68 MPH

PASS 1-B OVER SECOND SERIES OF TIES: 0.10 MIN 5.68 MPH

REMARKS: Rear pallet chocks were disengaged from the container corner post.  
1-inch x 3-inch channel steel bent. Damage was caused from engagement with a  
plate on the pallet. Pallet chocks were replaced and spaced to prevent pallet  
engagement. TEST SEQUENCE STARTED OVER. .

# RAIL IMPACT DATA

TEST NO. 3

DATE: 6 FEBRUARY 1990

TEST SPECIMEN: TOFC, ISO container, LRP and MLRS pods.

TEST CAR NO.	TTX 153487	LT. WT.	73,400	pounds
CHASSIS NO.	5394	LT. WT.	6,040	pounds
CONTAINER NO.	INBU 2598901	LT. WT.	5,200	pounds
LPR NO.	EDIT 3007	LT. WT.	3,600	pounds
LADING AND DUNNAGE		WT.	20,000	pounds
	TOTAL SPECIMEN	WT.	108,240	pounds
	BUFFER CAR (5 CARS)	WT.	250,000	pounds

IMPACT NO.	END STRUCK	VELOCITY (MPH)	REMARKS
1	rear	5.36	Chocks loose both sides.
2	rear	6.15	Pallet moved 1/4 inch to rear.
3	rear	8.15	1/2-inch shift to rear.
4	forward	8.33	Pallet shifted a total of 1 inch to rear.

# ROAD TEST DATA

TEST NO. 4

DATE: 7 FEBRUARY 1990

TEST SPECIMEN: TOFC, ISO container, LRP and MLRS pods.

PASS 1-A OVER FIRST SERIES OF TIES: 0.10 MIN 5.68 MPH

PASS 1-B OVER SECOND SERIES OF TIES: 0.10 MIN 5.68 MPH

REMARKS: 1/8 inch forward load movement. Pallet chocks loosened, started tight.

PASS 2-A OVER FIRST SERIES OF TIES: 0.10 MIN 5.68 MPH

PASS 2-B OVER SECOND SERIES OF TIES: 0.10 MIN 5.68 MPH

REMARKS: Total 1/2-inch load movement. Chocks loose. No pallet or load damage, container ok.

30-MILE ROAD TEST: No change in load or blocking.

PANIC STOP TEST: No load movement.

PASS 3-A OVER FIRST SERIES OF TIES: 0.10 MIN 5.68 MPH

PASS 3-B OVER SECOND SERIES OF TIES: 0.10 MIN 5.68 MPH

REMARKS: No change.

PASS 4-A OVER FIRST SERIES OF TIES: 0.10 MIN 5.68 MPH

PASS 4-B OVER SECOND SERIES OF TIES: 0.10 MIN 5.68 MPH

REMARKS: No damage or breakage to the unit loads or tiedown procedure.

WASHBOARD COURSE: No physical damage.

SHIPBOARD TRANSPORTATION SIMULATOR: No damage to container, LRP or MLRS pods.



# RAIL IMPACT DATA

TEST NO. 5

DATE: 9 FEBRUARY 1990

TEST SPECIMEN: TOFC, ISO container, LRP and 155mm projectiles.

TEST CAR NO.	TTX 153487	LT. WT.	73,400	pounds
CHASSIS NO.	5394	LT. WT.	6,040	pounds
CONTAINER NO.	INBU 2598901	LT. WT.	5,200	pounds
LRP NO.	EDIT 3008	LT. WT.	3,600	pounds
LADING AND DUNNAGE		WT.	37,500	pounds
	TOTAL SPECIMEN	WT.	125,740	pounds
	BUFFER CAR (5 CARS)	WT.	250,000	pounds

IMPACT NO.	END STRUCK	VELOCITY (MPH)	REMARKS
1	rear	4.21	Pallet shifted to rear  3/4 inch. Header assembly rotated. Stop Assemblies bending toward rear of container. Entire load shifted 1-1/2 inches to rear.
2	rear	6.58	LRP shifted to rear 1 inch at both sides. One pallet unit racked between first and second row.
3	rear	8.52	Unitization failed. LRP remained in position. Rear beam of unit load collapsed from impact force.

**PART 5**  
**TEST PROCEDURES**

# PROPOSED LOADING AND BRACING PROCEDURES FOR ATACMS (OR MLRS) ROCKET POD/CONTAINERS ON COMMERCIAL LOAD AND ROLL PLATFORM (FAST PALLET) IN COMMERCIAL CONTAINER

## INDEX

<u>ITEM</u>	<u>PAGE (S)</u>
COVER PAGE OF INTERIM PROCEDURE D-SMCAC-4465 -----	1
GENERAL NOTES -----	2
ROCKET POD/CONTAINER DETAIL & HANDLING GUIDANCE -----	3
ISOMETRIC OF LOAD IN CONTAINER -----	4
STRAPPING DETAILS -----	5
ISOMETRIC OF FULL LOAD PROCEDURES ON PLATFORM -----	6
NOSE BLOCKING & AFT CORNER RESTRAINT DETAILS -----	7
PHOTOGRAPHS FROM NOVEMBER 1987 DEMO SHIPMENT -----	8-9
PHOTOGRAPH OF 3 INCH WIDE WEB CARGO STRAP ASSEMBLY -----	10

**NOTE:** The attached 10 page document is an interim procedure (drawing D-SMCAC-4465) which is in the process of being superseded by a final procedure (drawing 19-48-8184 GM15RS3). This document is used to delineate proposed outloading procedures to be used for the shipment of ATACMS (or MLRS rocket pod/containers) when loaded on commercial Load and Roll Platform (Fast Pallet) and into a commercial container. The procedures as delineated are to be verified by rail impact, road transportability, and shipboard simulation tests prior to their approval for actual shipment.

Prepared during February 1989 by:

U.S. Army Defense Ammunition  
Center and School  
ATTN: SMCAC-DEO  
Savanna, IL 61074-9639



## GENERAL NOTES

## (GENERAL NOTES CONTINUED)

- A. THIS DOCUMENT HAS BEEN PREPARED AND ISSUED IN ACCORDANCE WITH AR 740-1 AND AUGMENTS TM 743-200-1 (CHAPTER 5).
- B. THIS DOCUMENT HAS BEEN PREPARED AND ISSUED TO SUPPORT A TRIAL SHIPMENT PROGRAM. THE OUTLOADING PROCEDURES DEPICTED HEREIN ARE APPLICABLE TO THE MULTIPLE LAUNCH ROCKET SYSTEM ROCKET POD/CONTAINER (RP/C). SUBSEQUENT REFERENCE TO CONTAINER HEREIN MEANS THE RP/C WITH ROCKET COMPONENTS.
- C. FOR DETAILS OF THE ROCKET POD/CONTAINER, SEE US ARMY MISSILE COMMAND DRAWING NO. 13027900.

CONTAINER DIMENSIONS —13'-30" LONG BY 41-1/2" WIDE BY 33" HIGH.

GROSS WEIGHT —————5,078 POUNDS (APPROX).

- D. THIS ITEM IS A DOT CLASS "A" EXPLOSIVE, AND A COAST GUARD CLASS "X-C". THE OUTLOADING PROCEDURES SPECIFIED HEREIN CAN ALSO BE UTILIZED FOR THE SHIPMENT OF THE DEPICTED CONTAINERS WHEN THEY ARE LOADED WITH AN ITEM WHICH IS IDENTIFIED DIFFERENTLY BY NOMENCLATURE THAN THE ITEM DESIGNATED IN THE DRAWING TITLE.
- E. THE LOAD AS SHOWN IS BASED ON A 4,700 POUND 20'-0" LONG BY 8'-0" WIDE BY 8'-4" HIGH INTERMODAL COMMERCIAL CONTAINER WITH INSIDE DIMENSIONS OF 19'-4" LONG BY 72" WIDE BY 95" HIGH. THE LOAD IS DESIGNED FOR TRAILER/CONTAINER-ON-FLATCAR (T/COFC) SHIPMENT, HOWEVER, THE LOAD AS DESIGNED CAN ALSO BE MOVED BY OTHER SURFACE MODES OF TRANSPORT. **NOTICE:** OTHER CONTAINERS OF THE SAME DESIGN CONFIGURATION CAN BE USED.
- F. WHEN LOADING THE CONTAINERS, THEY ARE TO BE POSITIONED SO AS TO ACHIEVE TIGHT LOAD (TIGHT AGAINST THE FORWARD BLOCKING ASSEMBLY). ALTHOUGH A TOTAL OF ONE AND ONE-HALF INCHES OF UNBLOCKED SPACE ACROSS THE WIDTH OF THE LOAD BAY IS PERMITTED, LATERAL VOIDS WITHIN THE LOAD ARE TO BE HELD TO A MINIMUM. EXCESSIVE SLACK CAN BE ELIMINATED FROM A LOAD BY LAMINATING ADDITIONAL PIECES OF APPROPRIATE THICKNESS TO THE FILL PIECES ON THE CORNER RETAINER PIECES. NAIL EACH ADDITIONAL PIECE TO THE FILL PIECE W/4 APPROPRIATELY SIZED NAILS. ADDITIONALLY, THE THICKNESS OF THE FILL PIECES MAY BE ADJUSTED AS REQUIRED TO FACILITATE VARIANCE IN THE LENGTH OF THE LOAD AND ROLL PLATFORM.
- G. DUNNAGE LUMBER SPECIFIED IS OF NOMINAL SIZE. FOR EXAMPLE, 1" X 6" MATERIAL IS ACTUALLY 3/4" THICK BY 5-1/2" WIDE AND 2" X 6" MATERIAL IS ACTUALLY 1-1/2" BY 5-7/8" WIDE.
- H. WHEN STEEL STRAPPING IS SEALED AT AN END-OVER-END LAP JOINT, A MINIMUM OF ONE SEAL WITH TWO PAIR OF NOTCHES WILL BE USED. A MINIMUM OF TWO SEALS, BUTTED TOGETHER, WITH TWO PAIR OF CRIMPS PER SEAL WILL BE USED TO SEAL THE JOINT WHEN A CRIMP TYPE SEALER IS BEING USED. REFER TO THE "STRAP JOINT A" AND "STRAP JOINT B" DETAILS ON PAGE 5 FOR GUIDANCE.
- J. PORTIONS OF THE CONTAINER DEPICTED WITHIN THIS DRAWING, SUCH AS ONE OF THE SIDE WALLS, HAVE NOT BEEN SHOWN IN THE LOAD VIEW FOR CLARITY PURPOSES.
- K. DIMENSIONS GIVEN FOR DUNNAGE PIECES OR ASSEMBLIES WILL BE FIELD CHECKED PRIOR TO THEIR ASSEMBLY AND INSTALLATION IN THE COMMERCIAL CONTAINER.
- L. REQUIREMENTS CITED WITHIN THE BUREAU OF EXPLOSIVES PAMPHLET 6C APPLY WHEN THE SHIPMENT MOVES BY TRAILER/CONTAINER-ON-FLATCAR (T/COFC). SPECIAL T/COFC NOTES FOLLOW:

1. A LOADED CONTAINER MUST BE ON A CHASSIS EQUIPPED WITH TWO BOGIE ASSEMBLIES WHEN BEING MOVED IN T/COFC SERVICE.
2. THE LOAD LIMIT OF A T/COFC RAILCAR MUST NOT BE EXCEEDED, NOR WILL A CAR BE LOADED SO THAT THE TRUCK UNDER ONE END OF THE CAR CARRIES MORE THAN ONE-HALF OF THE LOAD LIMIT FOR THAT CAR.

(CONTINUED AT RIGHT)

## MATERIAL SPECIFICATIONS

LUMBER ————— TM 743-200-1 (DUNNAGE LUMBER) AND FED SPEC MM-L-731.

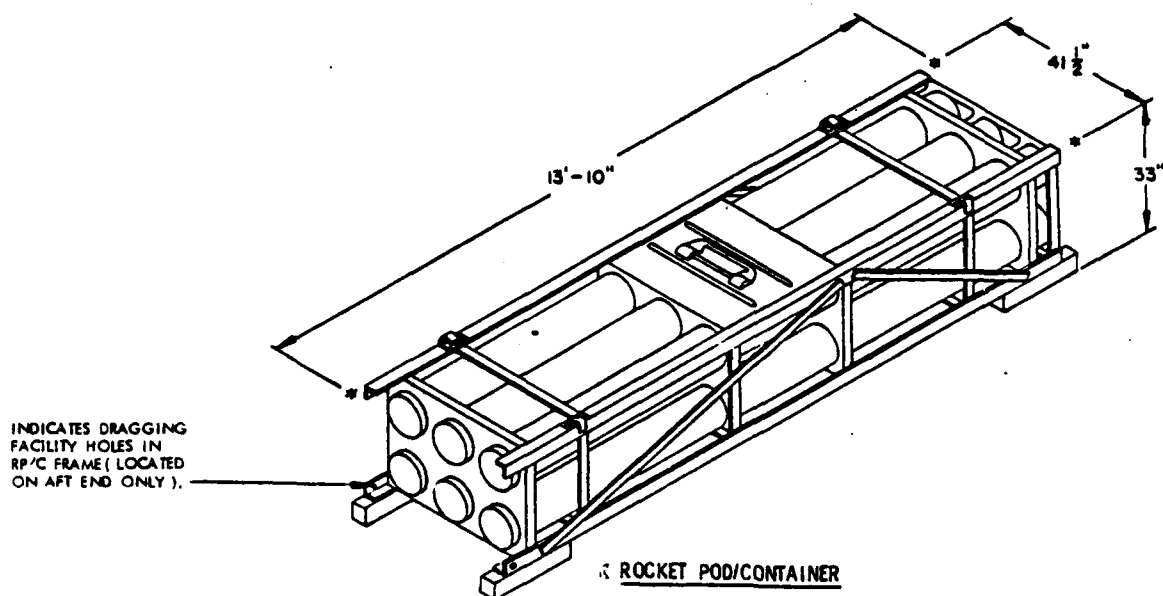
NAILS ————— FED SPEC FF-N-105; COMMON.

WIRE ————— FED SPEC QQ-W-461.

LOAD AND ROLL PLATFORM — LRP-10THP-MLES-A1, BALANCE BEARING 748857.

ANTI-CHIPPING MATERIAL  
FIBERBOARD ————— FED SPEC PPP-F-380; TYPE 3F (SOLID FIBERBOARD), CLASS-DOMESTIC, ALL GRADES.

- M. DURING INTRASTATE AND/OR INTERSTATE MOVES BY MOTOR CARRIER, A PROPER CHASSIS/MODIFIED FLAT BED TRAILER MUST BE USED TO PRECLUDE VIOLATION OF ONE OR MORE "WEIGHT LAWS" APPLICABLE TO THE STATE OR STATES INVOLVED.
- N. CONVERSION TO METRIC EQUIVALENTS: DIMENSIONS WITHIN THIS DOCUMENT ARE EXPRESSED IN INCHES AND WEIGHTS ARE EXPRESSED IN POUNDS. WHEN NECESSARY, THE METRIC EQUIVALENTS MAY BE COMPUTED ON THE BASIS OF ONE INCH EQUALS 25.4MM AND ONE POUND EQUALS 0.454KG.



### SPECIAL HANDLING GUIDANCE

#### 1. CONTAINER STACKING FOR OUTLOADING PURPOSES.

- THE UPPER CONTAINER SHOULD BE PLACED AS CLOSELY AS POSSIBLE IN VERTICAL ALIGNMENT WITH THE LOWER CONTAINER.
- WHEN STACKING THESE CONTAINERS, CARE MUST BE EXERCISED TO INSURE THAT THE INTERLOCKING HOLES IN THE BOTTOM OF THE CONTAINER SKIDS ALIGN CORRECTLY WITH THE INTERLOCKING PINS ON THE TOP OF THE CONTAINER FRAME. THIS WILL PRECLUDE DAMAGE TO THE SKIDS AND INSURE PROPER FUNCTIONING OF THE CONTAINER INTERLOCKS.

#### 2. CONTAINER OR CONTAINER STACK HANDLING.

**NOTES:** (1) MATERIALS HANDLING EQUIPMENT (MHE) IS INTENDED TO MEAN EQUIPMENT, SUCH AS FORKLIFT TRUCKS, CRANES, HAND TRUCKS, DOLLIES, ROLLER ASSEMBLIES, SLINGS, AND SPREADER BARS, THAT CAN BE USED TO HANDLE THE DEPICTED CONTAINERS.

(2) PRECAUTIONARY HANDLING TECHNIQUES NORMALLY EMPLOYED OR AS SPECIFIED FOR THE TYPE OF COMMODITY INVOLVED WILL BE OBSERVED.

- ONLY APPROVED AND APPROPRIATELY SIZED MHE WILL BE USED FOR HANDLING THE DEPICTED CONTAINERS.
- IF HANDLING IS ACCOMPLISHED WITH A FORKLIFT TRUCK, THE CONTAINERS SHOULD BE HANDLED FROM A SIDE POSITION ONLY. CARE MUST BE EXERCISED WHEN INSERTING THE FORKS UNDER THE CONTAINER TO PREVENT DAMAGE TO THE CONTAINER BY THE FORK TINES OR THE FORKLIFT PACKAGE GUARD. ADDITIONALLY, THE FORK TINES SHOULD BE PLACED UNDER THE CONTAINER'S STRONGEST AREAS; THAT IS, THE LATERAL FRAME MEMBERS/BULKHEADS LOCATED NEAR THE LONGITUDINAL CENTER OF THE CONTAINER.

#### 3. SEQUENTIAL CONTAINER LOADING.

- NOTE:** FOR EASE IN LOADING THE LOAD AND ROLL PLATFORM INTO THE COMMERCIAL CONTAINER, SET THE FORWARD END OF THE LOAD AND ROLL PLATFORM IN THE OPEN END OF THE COMMERCIAL CONTAINER AND INSTALL APPROPRIATELY SIZED 4" BY PLATFORM WIDTH MATERIAL UNDER THE REAR OF THE LOAD AND ROLL PLATFORM UNTIL THE PLATFORM IS LEVEL HORIZONTALLY.
- LOAD THE CONTAINERS OR CONTAINER STACKS BY FIRST INSERTING THE FAR SKIDS IN THE CENTER SKID HOLDERS ON THE LOAD AND ROLL PLATFORM, THEN LOWERING AND INSERTING THE NEAR SKIDS INTO THE OUTSIDE SKID HOLDERS ON THE PLATFORM. **NOTE:** THE AFT END OF THE CONTAINERS MUST BE POSITIONED AT THE FORWARD END OF LOAD AND ROLL PLATFORM.
- APPLY THE STACK UNITIZING STRAP. **NOTE:** FIBERBOARD ANTI-CHAFING MATERIAL MUST BE INSTALLED UNDER THE STRAPS AT ALL POINTS OF CONTACT WITH THE CONTAINERS.

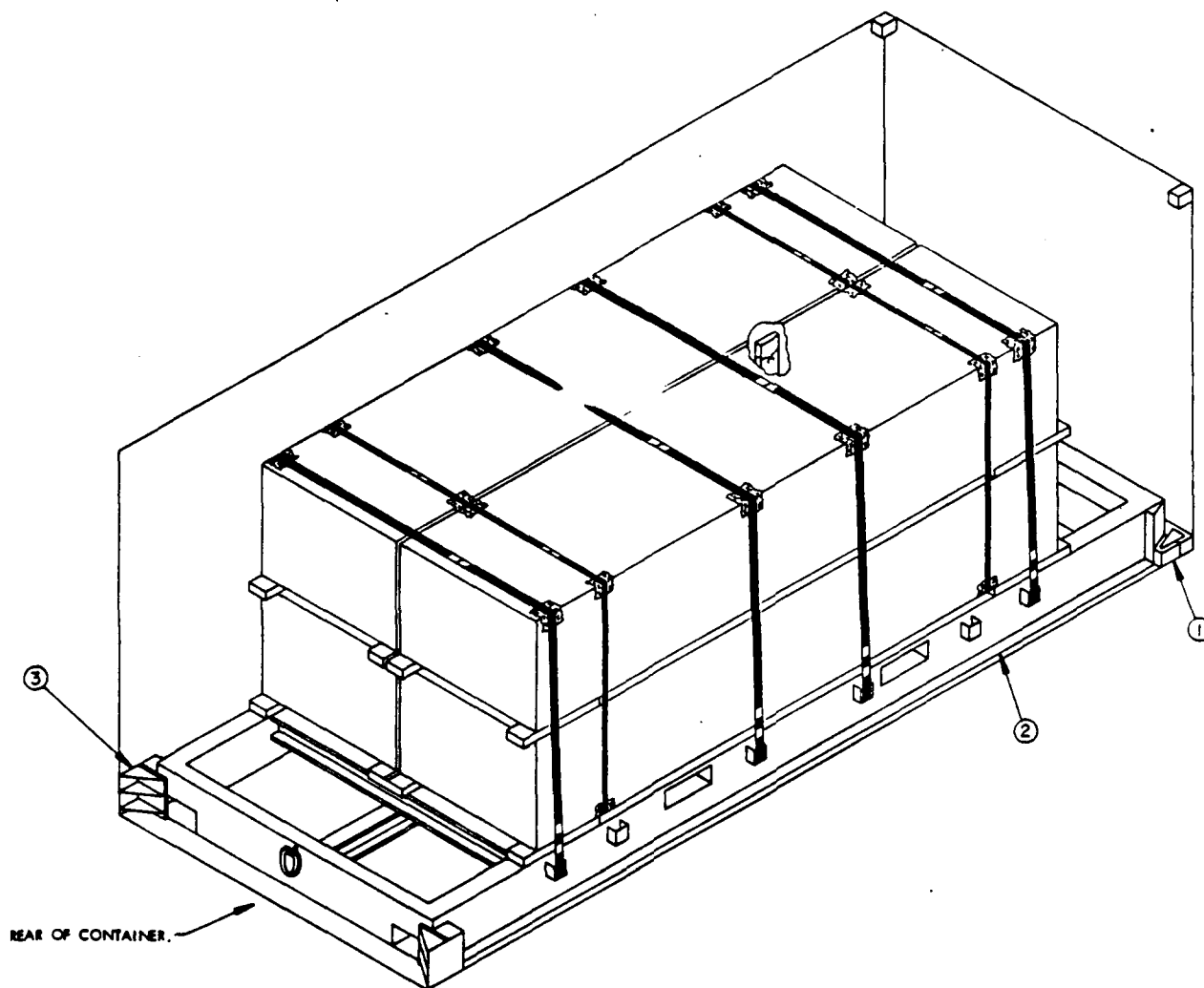
(CONTINUED AT RIGHT)

#### (SPECIAL HANDLING GUIDANCE CONTINUED)

- INSTALL THE CENTER FILL PIECES. POSITION THE CENTER FILL PIECES SO THAT THEY ARE SUPPORTED BY THE TOP SIDE OF THE FORK POCKET (TUNNEL) ON THE LOAD AND ROLL PLATFORM. WIRE TIE THE CENTER FILL PIECES TO THE CONTAINER FRAME.
- NEXT, LOAD AND UNITIZE THE REMAINING CONTAINERS IN THE MANNER DETAILED IN PARAGRAPHS 3B AND 3C AT LEFT.
- APPLY THE HOLD-DOWN STRAPS, POSITIONING FIBERBOARD ANTI-CHAFING MATERIAL UNDER THE STRAPS AT ALL POINTS OF CONTACT WITH THE CONTAINERS. **CAUTION:** THE HOLD-DOWN STRAPS MUST BE INSTALLED WITH CARE SO AS NOT TO HAVE EDGE-TO-EDGE CONTACT WITH THE STACK UNITIZING STRAPS.
- POSITION THE FORWARD BLOCKING ASSEMBLY IN THE COMMERCIAL CONTAINER. LIFT THE REAR END OF THE LOAD AND ROLL PLATFORM WITH APPROPRIATELY SIZED MHE UNTIL ONLY THE ROLLER CONTACTS THE COMMERCIAL CONTAINER FLOOR (REF: 4"). ROLL THE PLATFORM INTO THE CONTAINER UNTIL IT CONTACTS THE FORWARD BLOCKING ASSEMBLY. SET THE REAR OF THE PLATFORM ON THE COMMERCIAL CONTAINER FLOOR. INSTALL THE CORNER RETAINER PIECES AND FILL MATERIAL AS NECESSARY.

#### UNLOADING THE LOAD AND ROLL PLATFORM FROM THE COMMERCIAL CONTAINER.

- THE LOAD AND ROLL PLATFORM MAY BE UNLOADED USING THE REVERSE OF THE METHOD DETAILED IN 3G ABOVE.
- THE LOAD AND ROLL PLATFORM MAY ALSO BE UNLOADED USING A VEHICLE WITH AN APPROPRIATELY SIZED WINCH. FIRST, REMOVE THE CORNER RETAINER PIECES. ATTACH THE WINCH TO THE D-RING ON THE REAR OF THE LOAD AND ROLL PLATFORM, RAISE THE PLATFORM UNTIL THE ROLLER CONTACTS THE COMMERCIAL CONTAINER FLOOR, AND PULL THE CONTAINER OUT USING THE WINCHING VEHICLE, TAKING CARE NOT TO PULL THE PLATFORM TOTALLY OUT OF THE COMMERCIAL CONTAINER. SET BLOCKING UNDER THE REAR END OF THE PLATFORM, AND UNLOAD THE MHS CONTAINERS, USING APPROPRIATELY SIZED MHE.



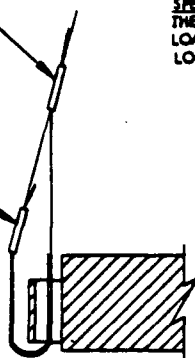
ISOMETRIC VIEW

KEY NUMBERS

- ① FORWARD BLOCKING ASSEMBLY (1 REQD). See page 5-9.
- ② LOAD AND ROLL PLATFORM, LOADED (1 REQD). SEE THE DETAIL ON PAGE 6.
- ③ CORNER RETAINER PIECE (2 REQD). See page 5-9.

INDICATES A SEAL FOR THE  
HOLD-DOWN STRAPS.

INDICATES A SEAL  
FOR THE PAD.



TIEDOWN DETAIL

**SPECIAL NOTE:**  
THE SEAL(S) USED TO FASTEN THE HOLD-DOWN STRAPS TO  
LOAD AND ROLL PLATFORM TIEDOWN ANCHOR SHOULD BE  
LOCATED A MINIMUM OF 18" ABOVE THE PLATFORM DECK.



ONE SEAL WITH  
TWO PAIR OF  
NOTCHES.

STRAP JOINT A

METHOD OF SECURING A  
STRAP JOINT WHEN USING  
A NOTCH-TYPE SEALER.



TWO SEALS, BUTTED  
TOGETHER, WITH  
TWO PAIR OF CRIMPS  
EACH SEAL.

STRAP JOINT B

METHOD OF SECURING A  
STRAP JOINT WHEN USING  
A CRIMP-TYPE SEALER.

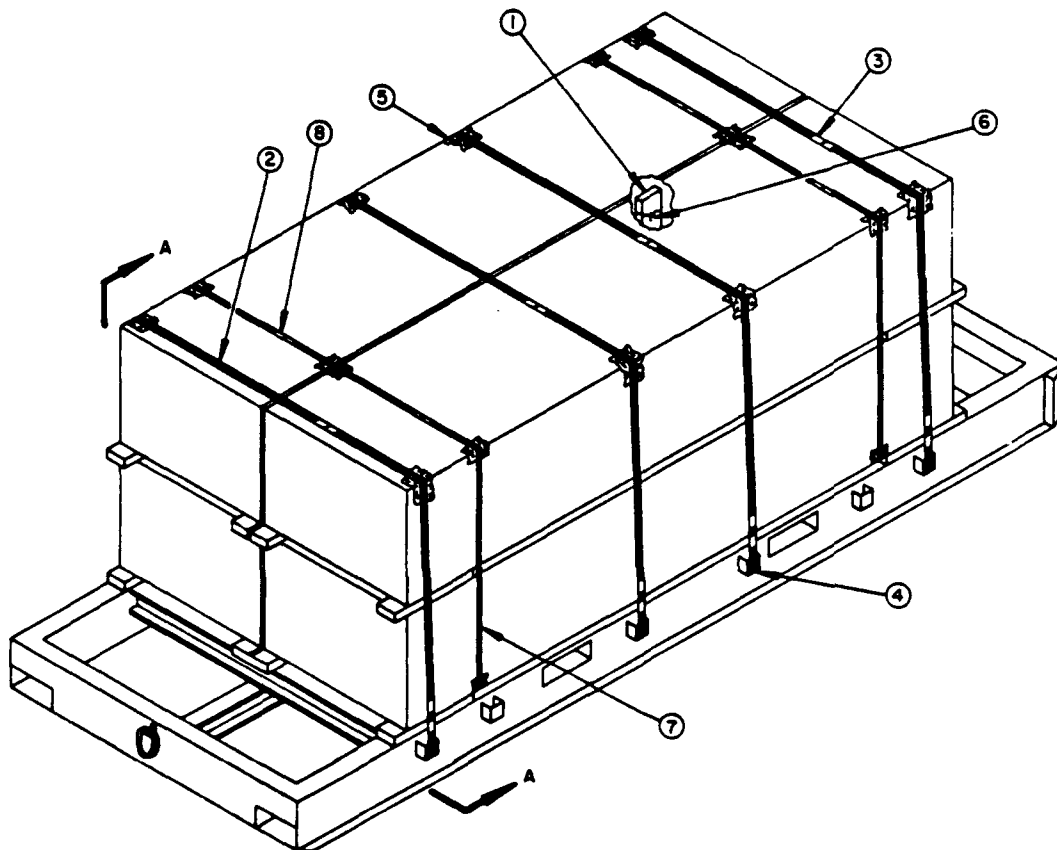
**BILL OF MATERIAL**

LUMBER	LINEAR FEET	BOARD FEET
2" X 6"	11	11
STEEL STRAPPING, 2" X .050"	128' REQD	43 LBS
SEAL, FOR 2" STRAPPING	24 REQD	5 LBS
STEEL STRAPPING, 1-1/4" X .035" OR .031"	80' REQD	12 LBS
SEAL FOR 1-1/4" STRAPPING	8 REQD	1/2 LBS
WIRE, NO. 14 GAGE	8' REQD	NIL
FIBERBOARD ANTI-CHAFING MATERIAL	AS REQD	NIL
LOAD AND ROLL PLATFORM	1 REQD	1,933 LBS

**LOAD AS SHOWN**

ITEM	ITEM	QUANTITY	WEIGHT (APPROX)
MILS RP/C-100		4	20,312 LBS
DUNNAGE			2,016 LBS
COMMERCIAL/STRAINED		1	4,700 LBS
TOTAL WEIGHT			27,028 LBS



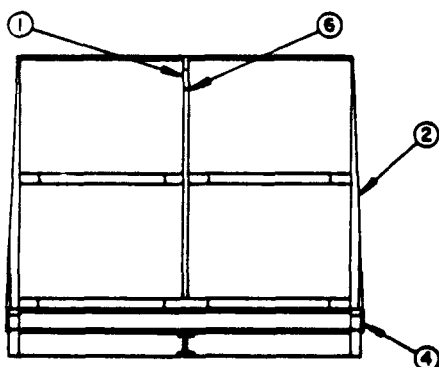


ISOMETRIC VIEW

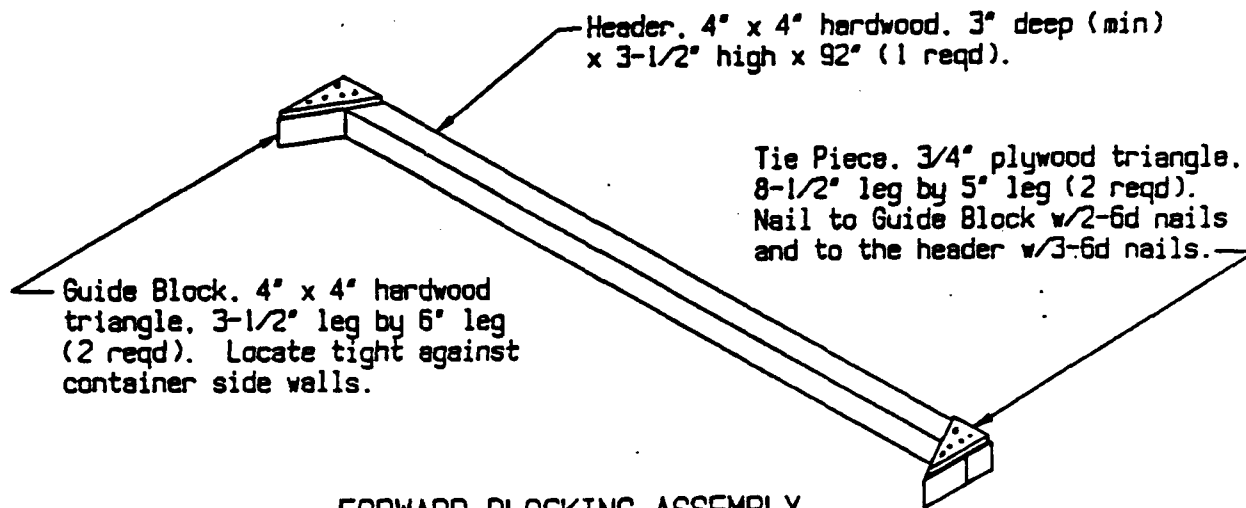
KEY NUMBERS

- ① CENTER FILL PIECE, 2" X 6" X 66" (2 REQD). POSITION ON THE FORKLIFT TUNNEL.
- \* ② HOLD-DOWN STRAP, 2" X .050" X 28'-0" LONG STEEL STRAPPING (4 REQD). INSTALL EACH STRAP FROM TWO 14'-0" LONG PIECES.
- \* ③ SEAL, 2" (24 REQD, 6 PER STRAP). DOUBLE CRIMP EACH SEAL, EXCEPT THOSE USED TO SECURE THE PADS, PIECES MARKED ④. SEE GENERAL NOTE "H" ON PAGE 2.
- ④ PAD, STRAPPING, 2" X .050" X 24" (8 REQD). PREPOSITION THE PAD BETWEEN THE STRAPPING, PIECE MARKED ②, AND THE LOAD AND ROLL PLATFORM TIEDOWN PROVISION AND SECURE WITH ONE PAIR OF CRIMPS. SEE THE "TIEDOWN DETAIL ON PAGE 5.
- ⑤ FIBERBOARD ANTI-CHAFING MATERIAL (AS REQD). PLACE UNDER STRAPPING AT ALL POINTS OF CONTACT WITH THE CONTAINERS.
- ⑥ TIE WIRE, NO. 14 GAGE WIRE, 24" LONG (4 REQD). WIRE TO FORM A LOOP AROUND A HORIZONTAL FRAME MEMBER OF A CONTAINER AND THE CENTER FILL PIECE, PIECE MARKED ①. BRING ENDS TOGETHER AND TWIST TAUT.
- ⑦ STACK UNITIZING STRAP, 1-1/4" X .035" OR .031" BY A LENGTH-TO-SUIT (REF: 20'-0") (4 REQD). INSTALL TO ENCIRCLE THE CONTAINERS IN ONE STACK.
- ⑧ SEAL, 1-1/4" (8 REQD, 2 PER STRAP). CRIMP EACH SEAL WITH TWO PAIR OF CRIMPS. SEE GENERAL NOTE "H" ON PAGE 2

\* Note: For the test program, a 3-inch-wide web cargo strap assembly is to be used in lieu of the steel strap and seal. The web cargo strap assembly is ANCRA part no. 48050-12 (8M-3D-3D-24-260P3) consisting of a heavy capacity ratchet, 3-inch-wide polyester webbing, a keepered flat hook on both ends, and a minimum capacity of 15,000 pounds. See page 5-12 for photograph.

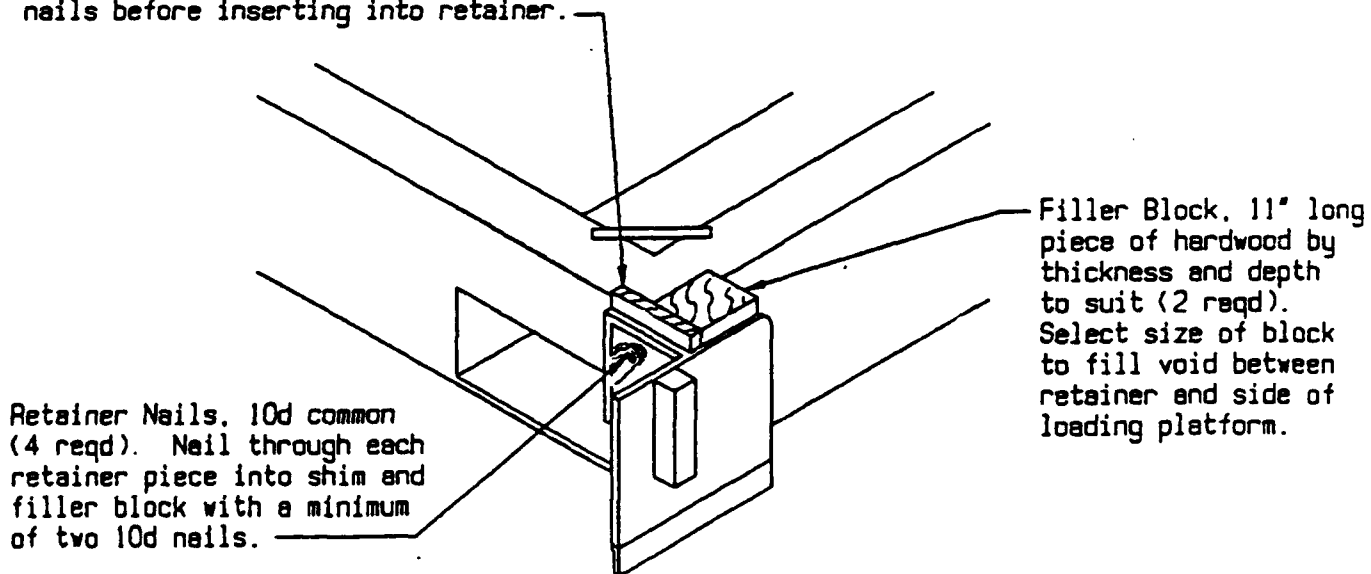


SECTION A-A

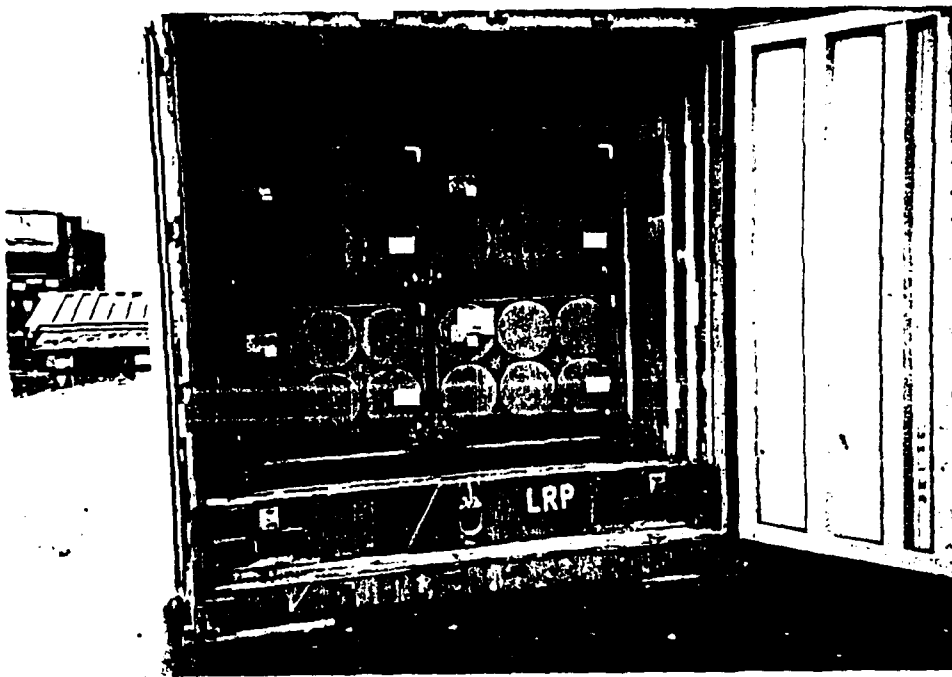


FORWARD BLOCKING ASSEMBLY

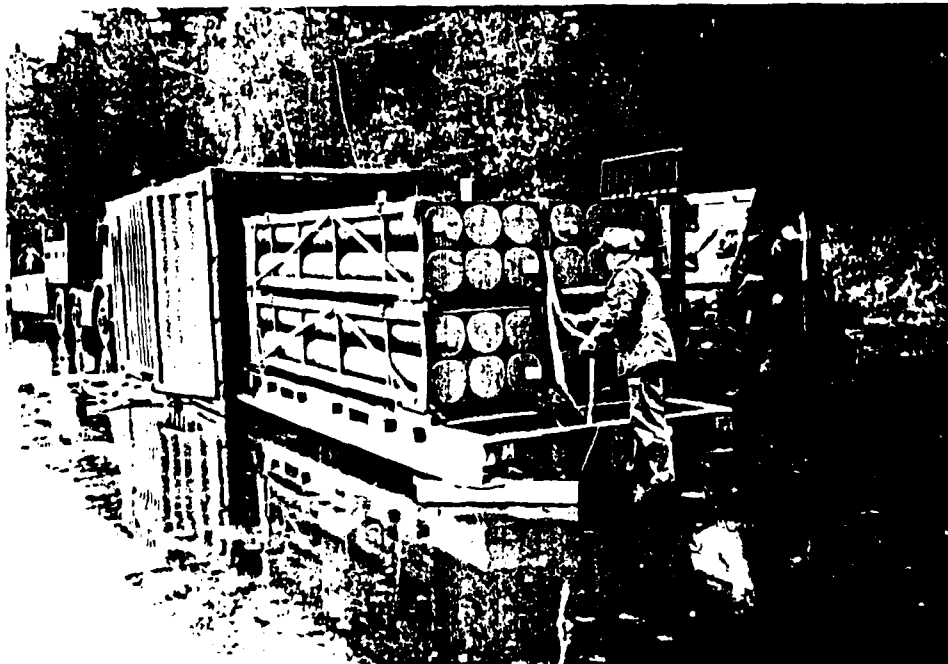
Shim. 6" x 11" plywood by thickness to suit (as reqd). Select thickness of plywood to fill void between face of retainer and end of loading platform. Nail plywood to filler block w/2-6d nails before inserting into retainer.



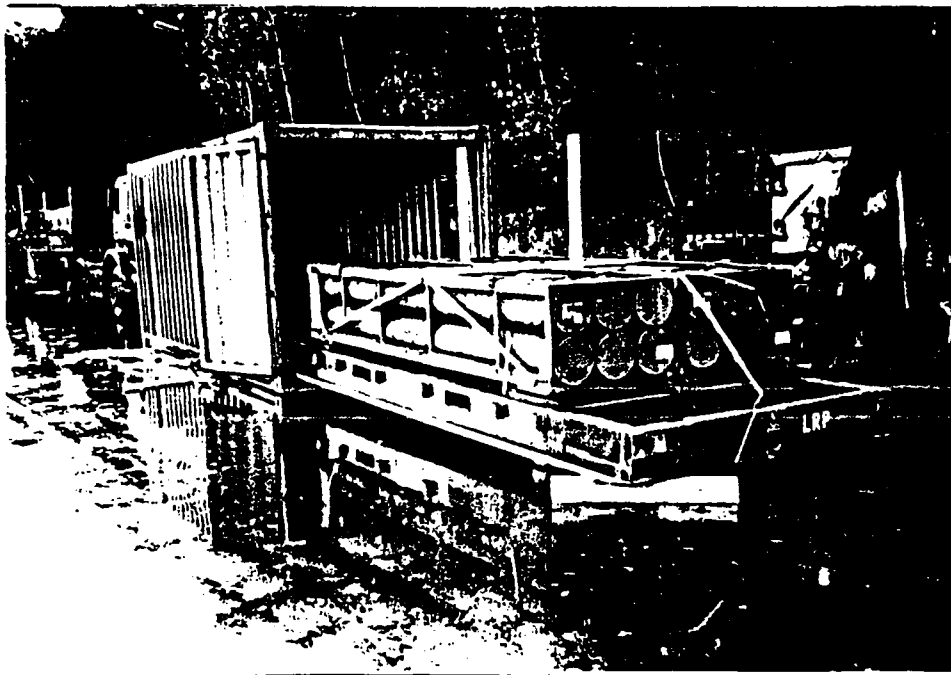
CORNER RETAINER PIECE



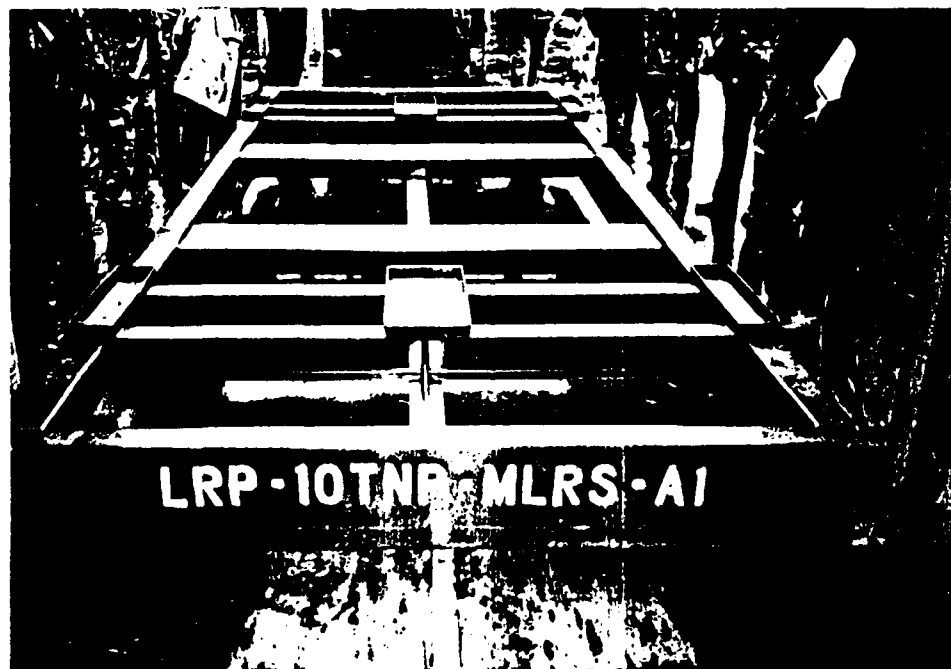
HLRS PODS SECURED ON LOAD AND ROLL PLATFORM (LRP)  
AND BLOCKED INSIDE STANDARD COMMERCIAL CONTAINER



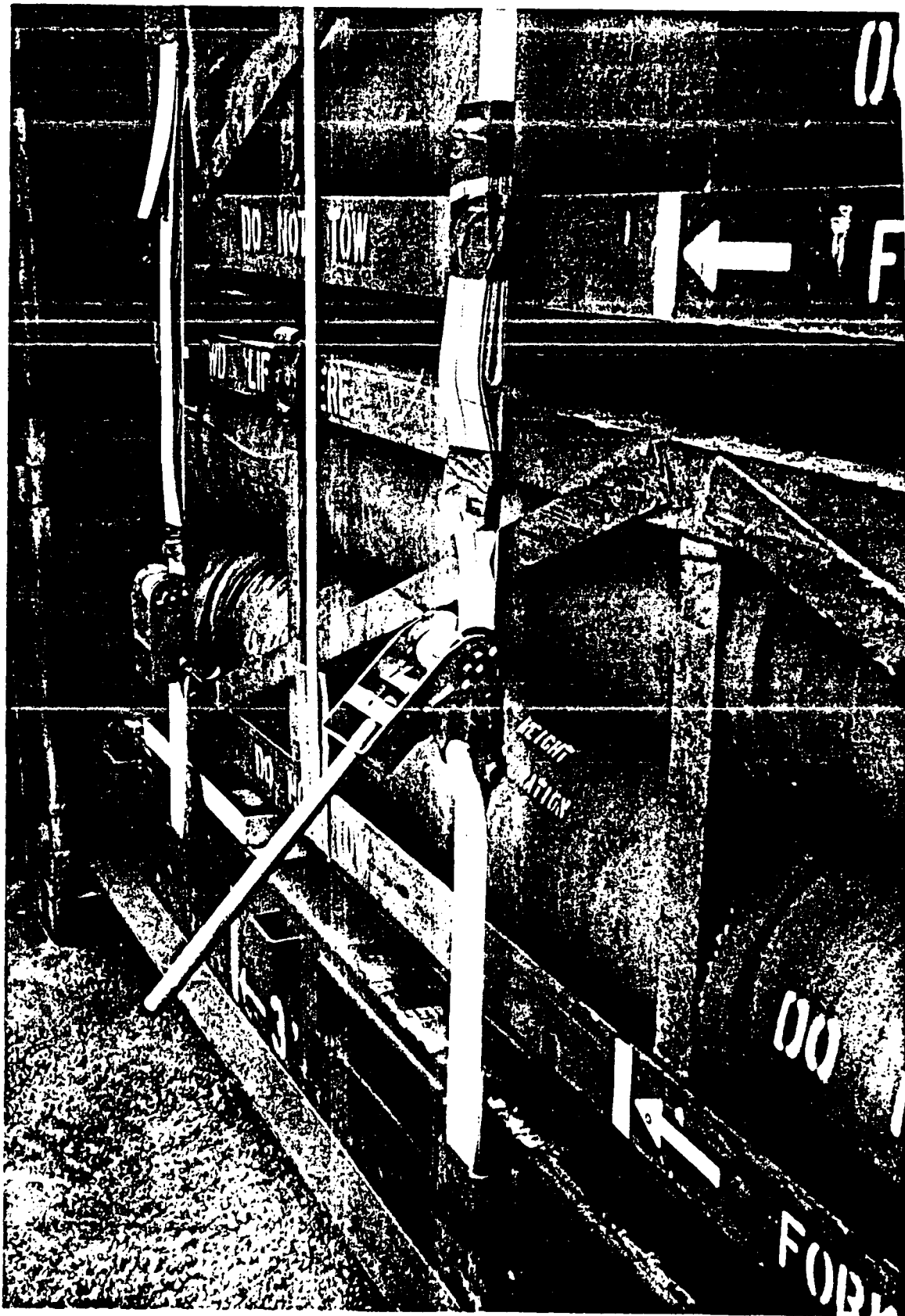
AFTER REMOVING CORNER BLOCKS AND ROLLING OUT LRP,  
HLRS PODS ARE ACCESSIBLE FOR DIRECT SIDE HANDLING



*TWO 6K FORKLIFTS PERFORM ENTIRE UNLOADING OPERATION  
AND LOAD TRAILER WITH THE FOUR PODS IN 5 MINUTES*



*OBSERVERS VIEW EMPTY LRP JUST PRIOR TO BEING ROLLED  
BACK INTO COMMERCIAL END OPENING CONTAINER*



The 3-inch-wide web cargo strap assemblies are depicted. Note the extension handle inserted in the ratchet of the strap assembly in the foreground.

# PROPOSED LOADING AND BRACING PROCEDURES FOR PALLETIZED UNITS OF 155MM SEPARATE LOADING PROJECTILES ON COMMERCIAL LOAD AND ROLL PLATFORM (FAST PALLET) IN COMMERCIAL CONTAINER

## LOAD AS SHOWN

<u>ITEM</u>	<u>QUANTITY</u>	<u>WEIGHT (APPROX)</u>
PALLET UNITS --- 42 • 873 LBS -----		36,866 LBS
DUNNAGE -----		225 LBS
FAST PALLET -----		3,600 LBS
CONTAINER -----		4,700 LBS
-----		-----
TOTAL WEIGHT -----		45,191 LBS

## INDEX

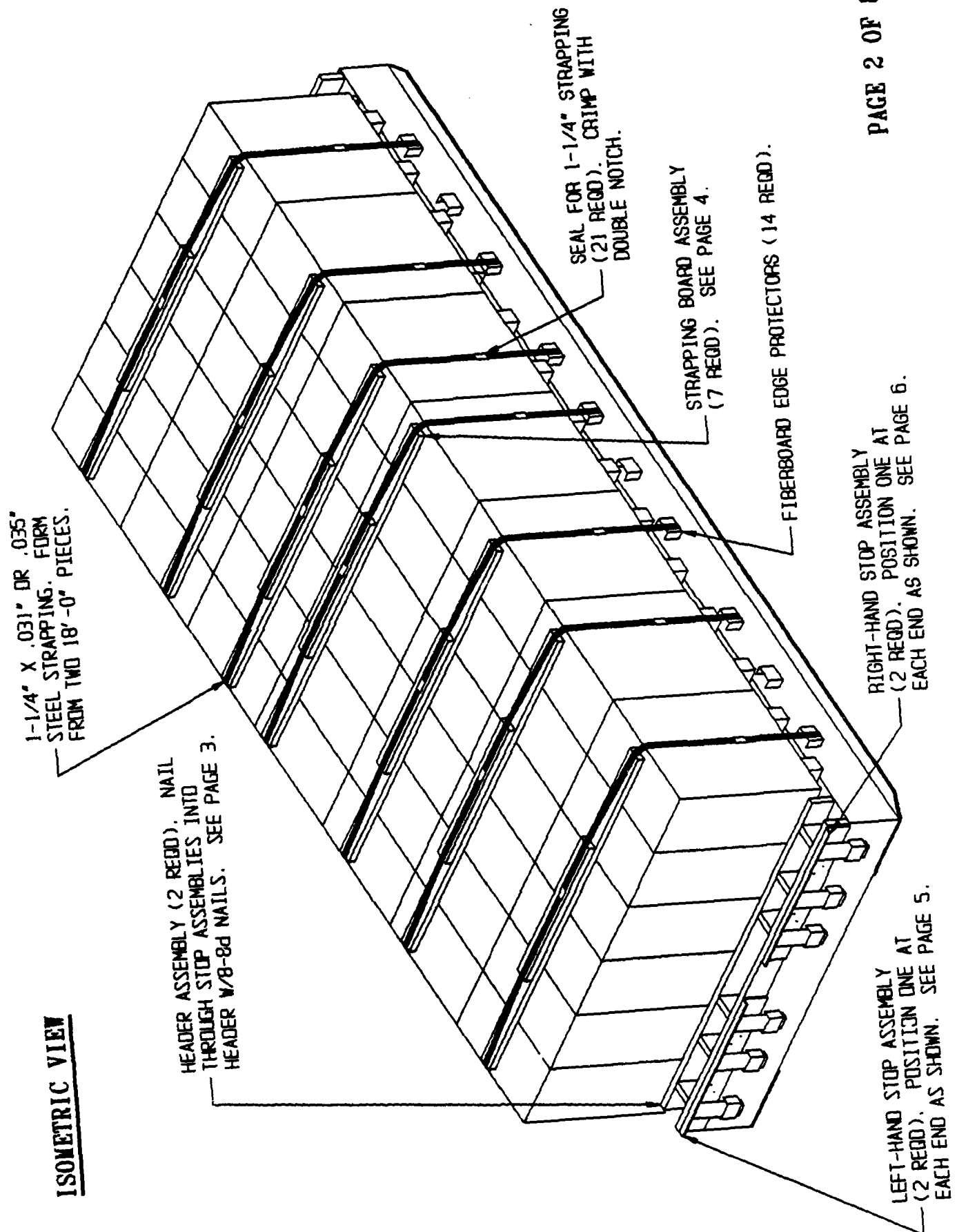
<u>ITEM</u>	<u>PAGE (S)</u>
ISOMETRIC OF FULL LOAD PROCEDURES -----	2
DETAILS -----	3-8

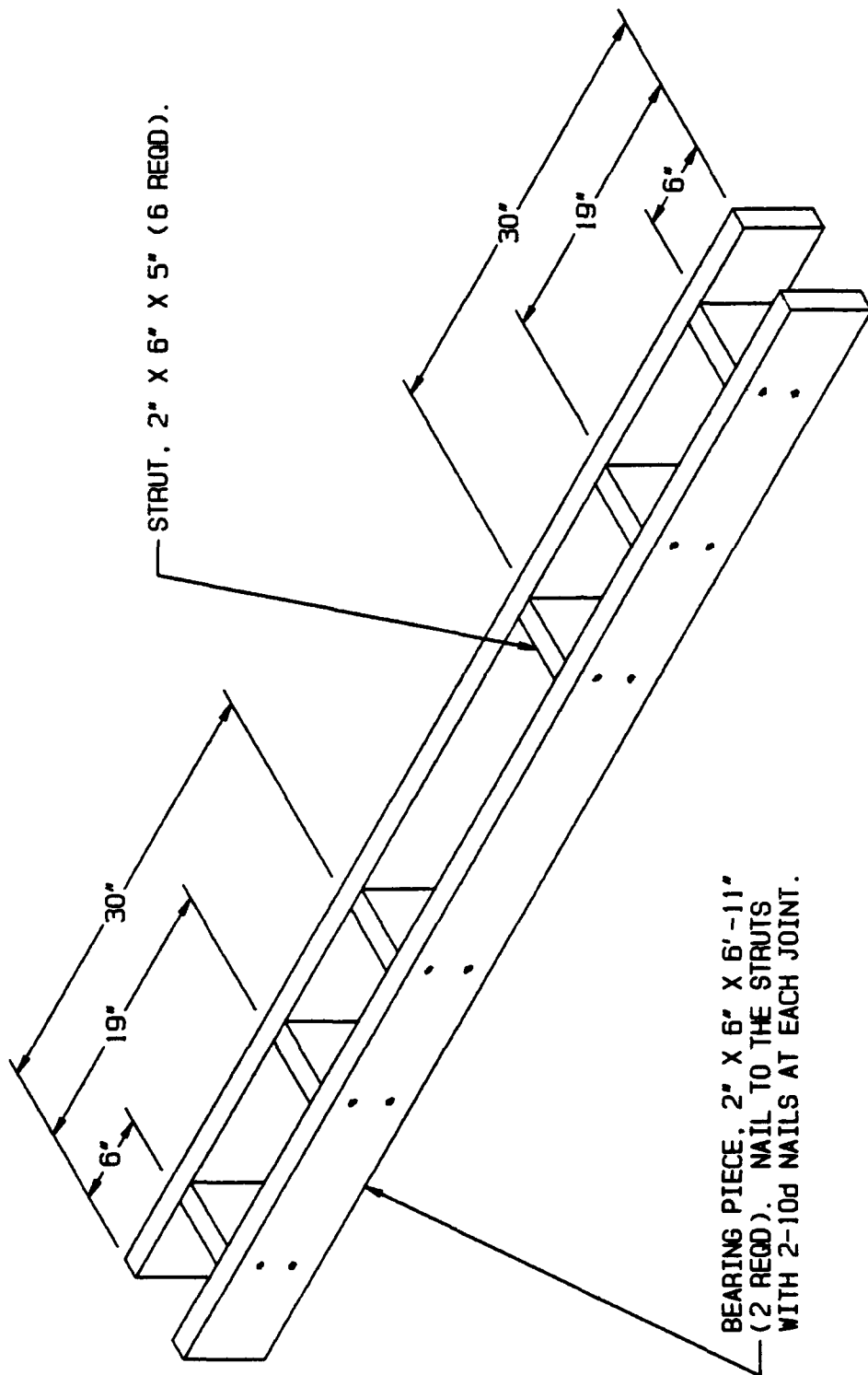
**NOTE:** This 8 page document delineates proposed outloading procedures to be used for the shipment of palletized 155mm separate loading projectiles on commercial Load and Roll Platform (Fast Pallet) and into a commercial container. The procedures as delineated are to be verified by rail impact, road transportability, and shipboard simulation tests prior to their approval for actual shipment.

Prepared during February 1989 by:

U.S. Army Defense Ammunition  
Center and School  
ATTN: SMCAC-DEO  
Savanna, IL 61074-9639

# ISOMETRIC VIEW



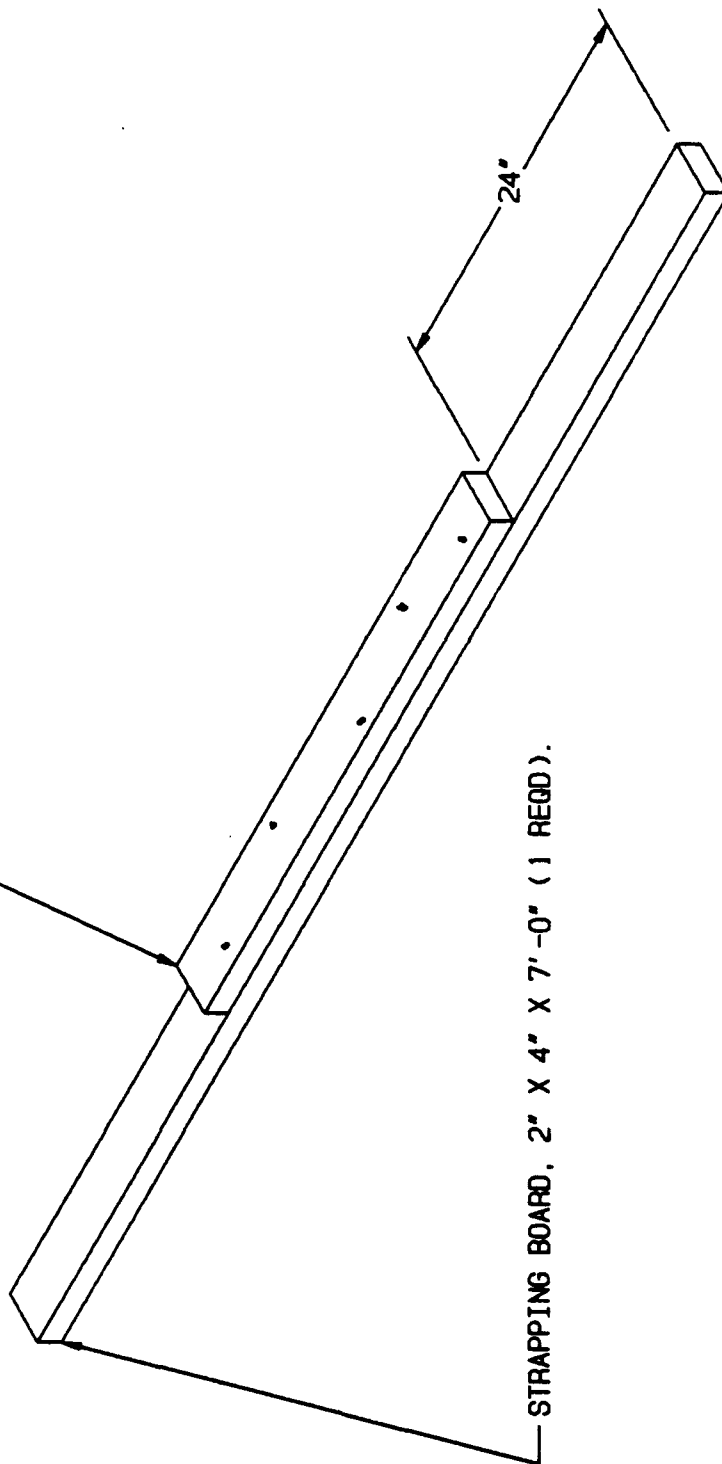


## HEADER ASSEMBLY

PAGE 3 OF 8



PURCHASE BOARD, 2" X 4" X 36" (1 REQD).  
NAIL TO THE STRAPPING BOARD W/5-10d NAILS.

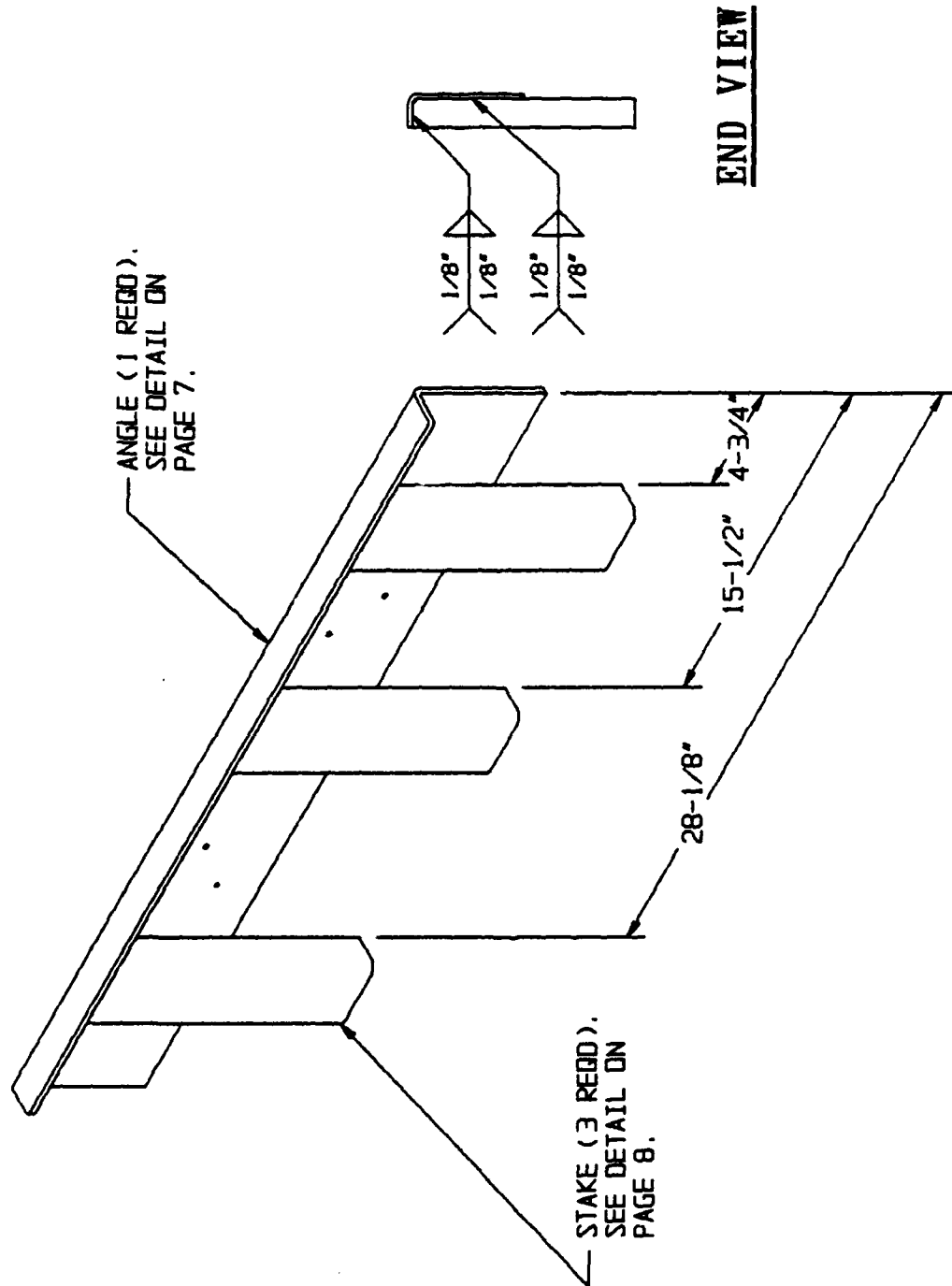


STRAPPING BOARD, 2" X 4" X 7'-0" (1 REQD).

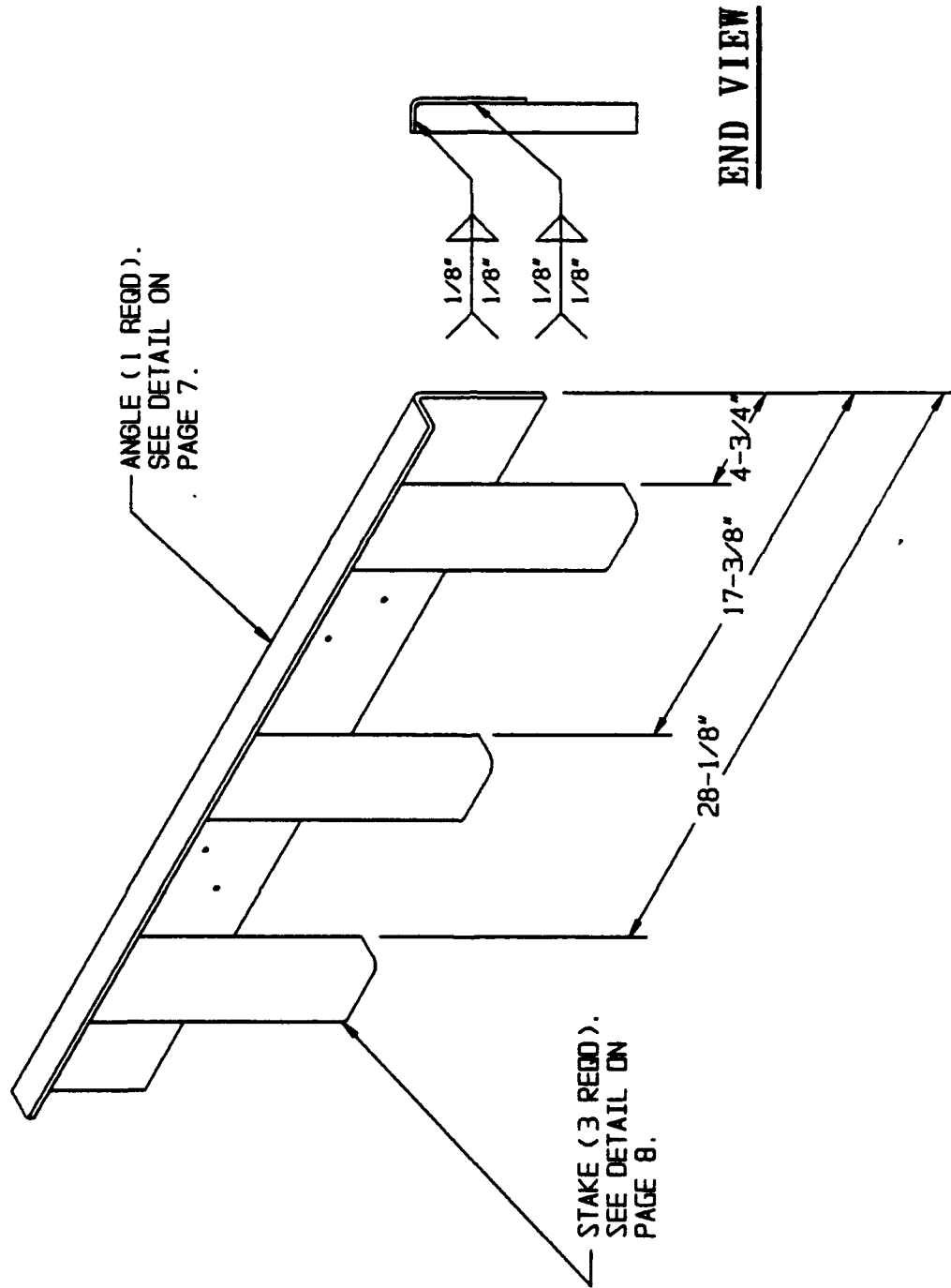
## STRAPPING BOARD ASSEMBLY

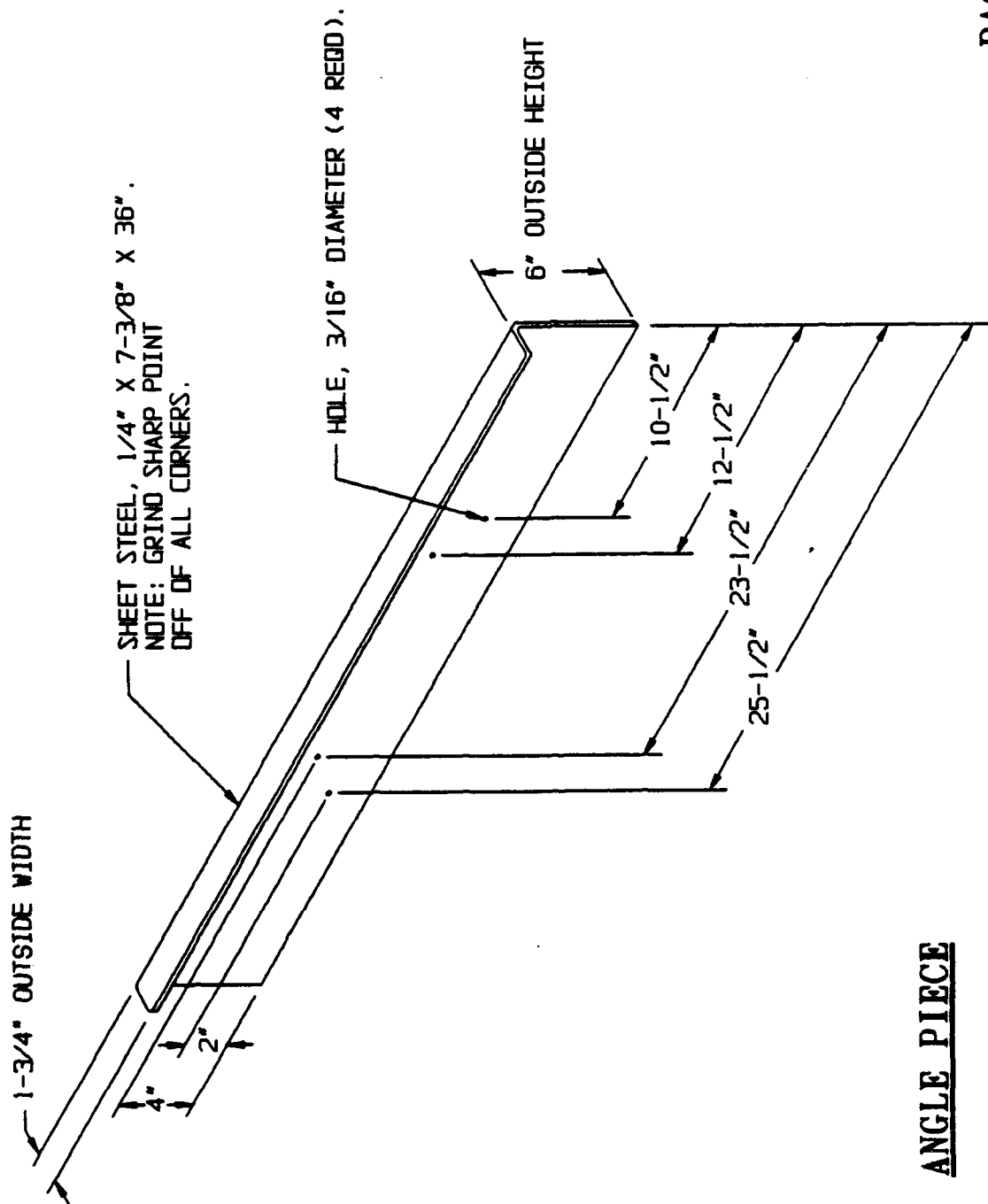
PAGE 4 OF 8

# LEFT-HAND STOP ASSEMBLY

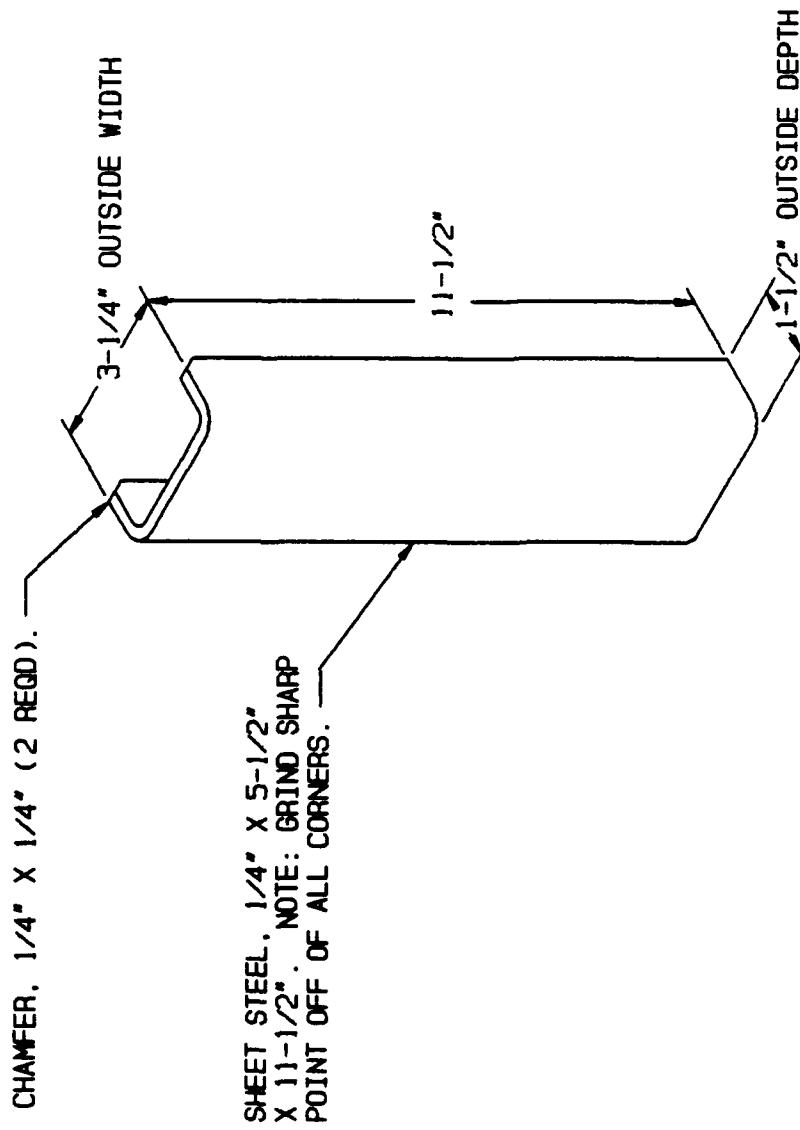


# RIGHT-HAND STOP ASSEMBLY





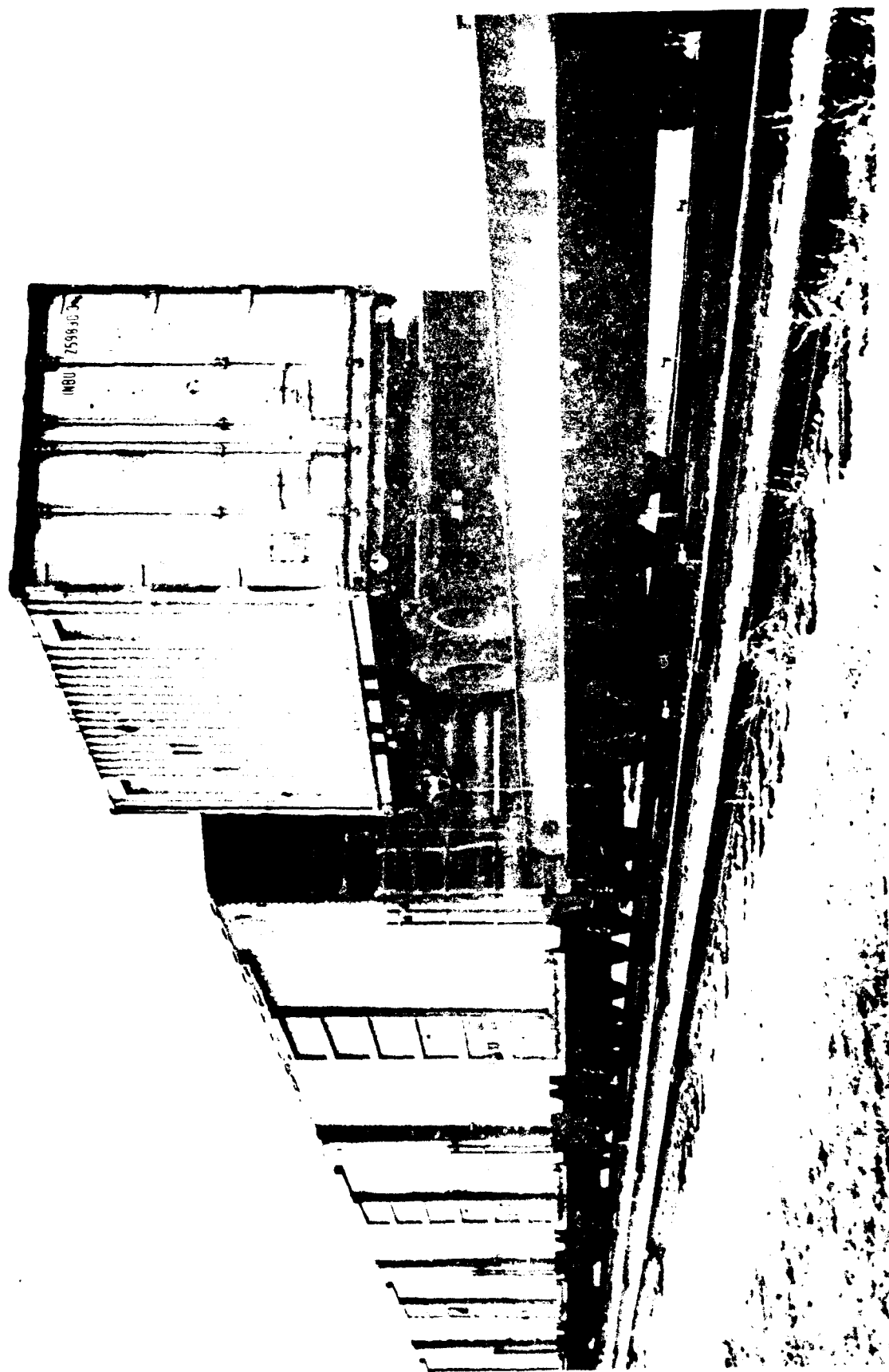
# ANGLE PIECE



# STAKE PIECE

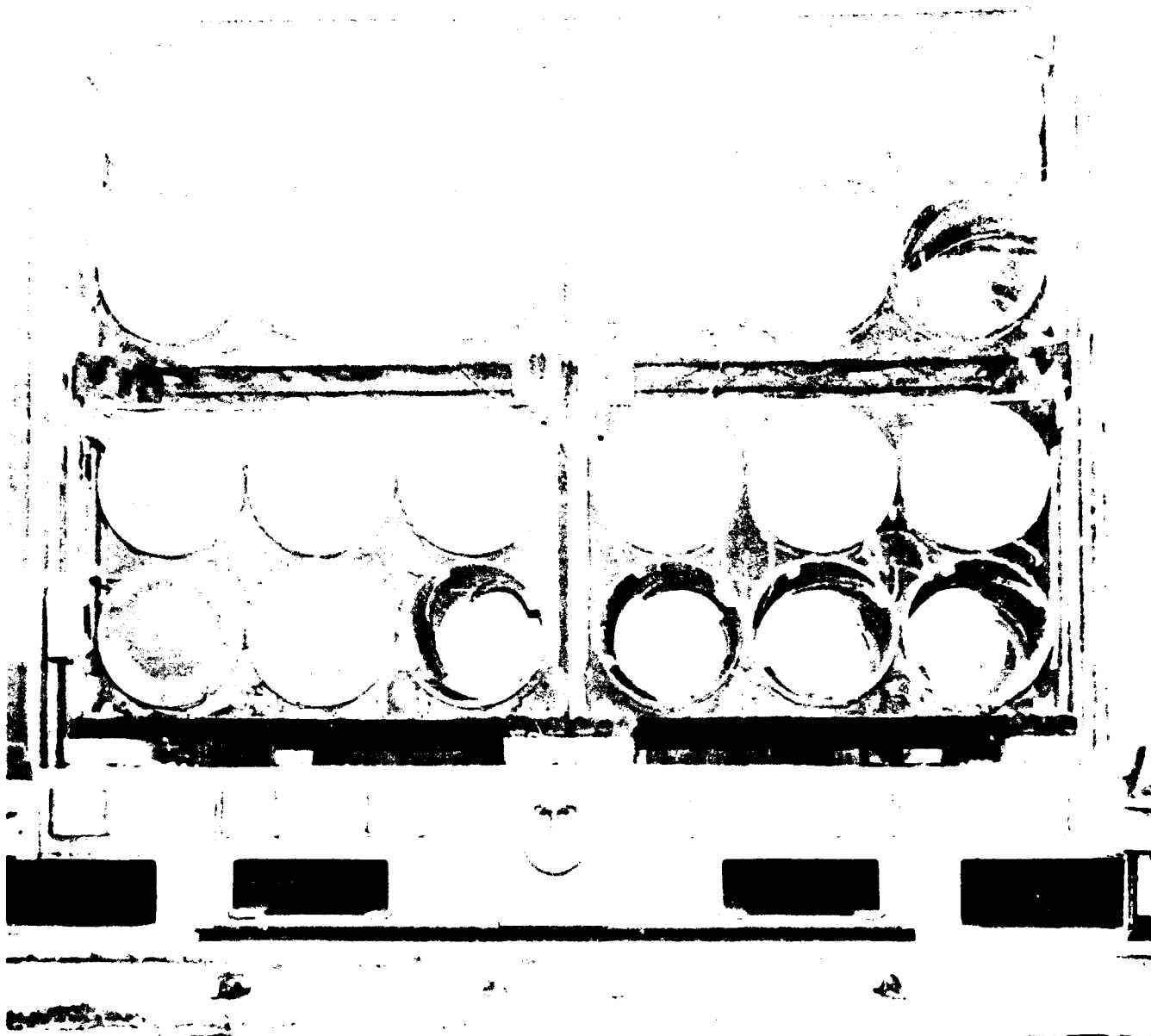
PAGE 8 OF 8

PART 6  
PHOTOGRAPHS



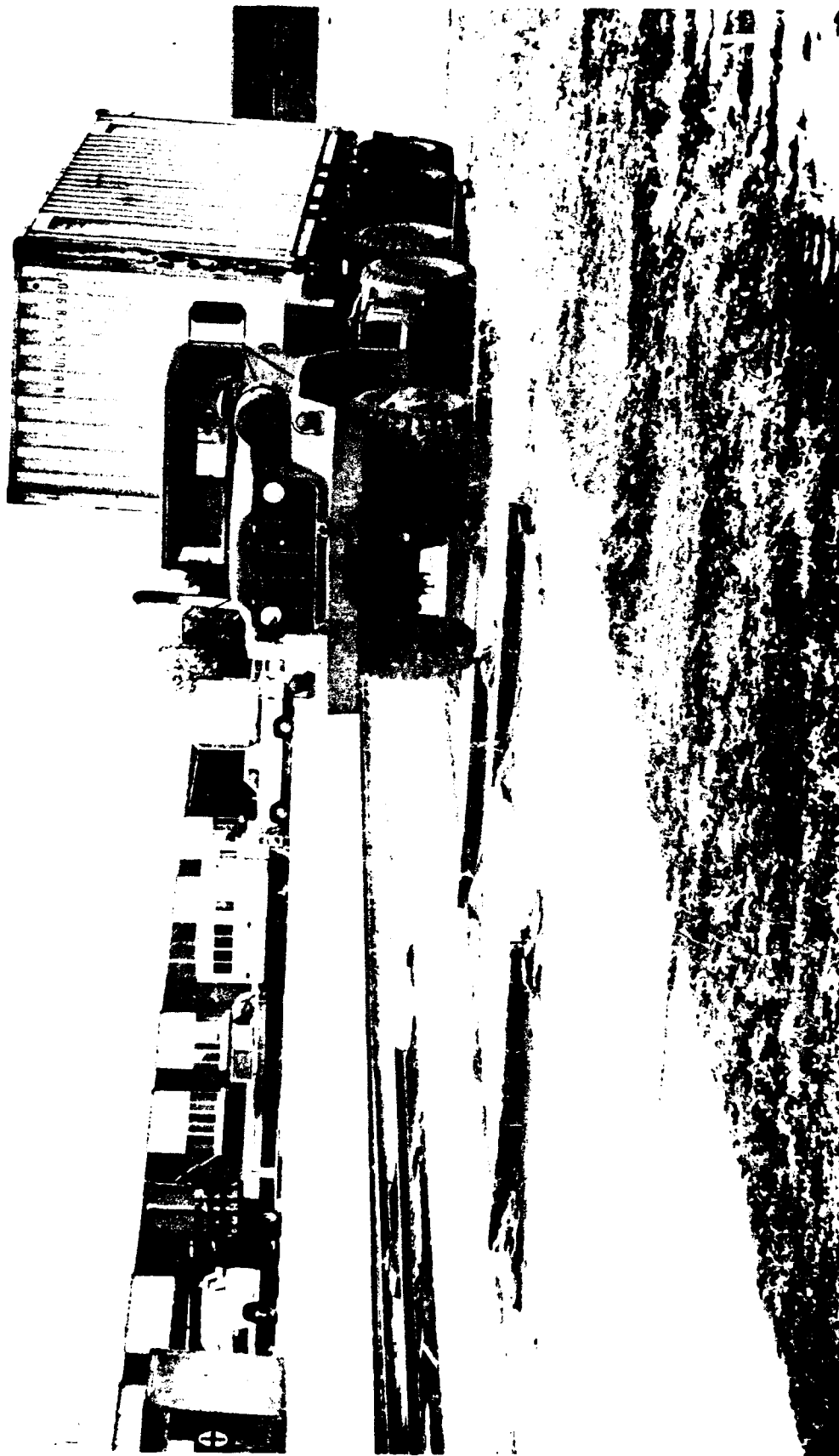
DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

Part 30.1 This photo shows the forward end of the 150mm projectile from a 150mm gun. The 150mm projectile has a diameter of 150mm, a length of 1.5m, and a weight of 150kg. The 150mm projectile is shown in the foreground, and the 150mm gun is shown in the background.



1	DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL	
<p>1. The purpose of this document is to provide information regarding the Defense Ammunition Center and School (DAC&amp;S) located in Savanna, Illinois. This document is intended for use by personnel assigned to the DAC&amp;S and is not to be distributed outside of the facility.</p> <p>2. The DAC&amp;S is a major center for the development, testing, and evaluation of ammunition and related equipment. It is responsible for ensuring that the ammunition and equipment developed and tested at the DAC&amp;S meet the requirements of the Department of Defense.</p> <p>3. The DAC&amp;S is organized into several functional areas, including:</p> <ul style="list-style-type: none"><li>a. Development and Testing</li><li>b. Evaluation and Acceptance</li><li>c. Production and Distribution</li><li>d. Research and Development</li></ul> <p>4. The DAC&amp;S is a key component of the Defense Ammunition Center and School (DAC&amp;S) and is responsible for ensuring that the ammunition and equipment developed and tested at the DAC&amp;S meet the requirements of the Department of Defense.</p>		





90-1554

DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

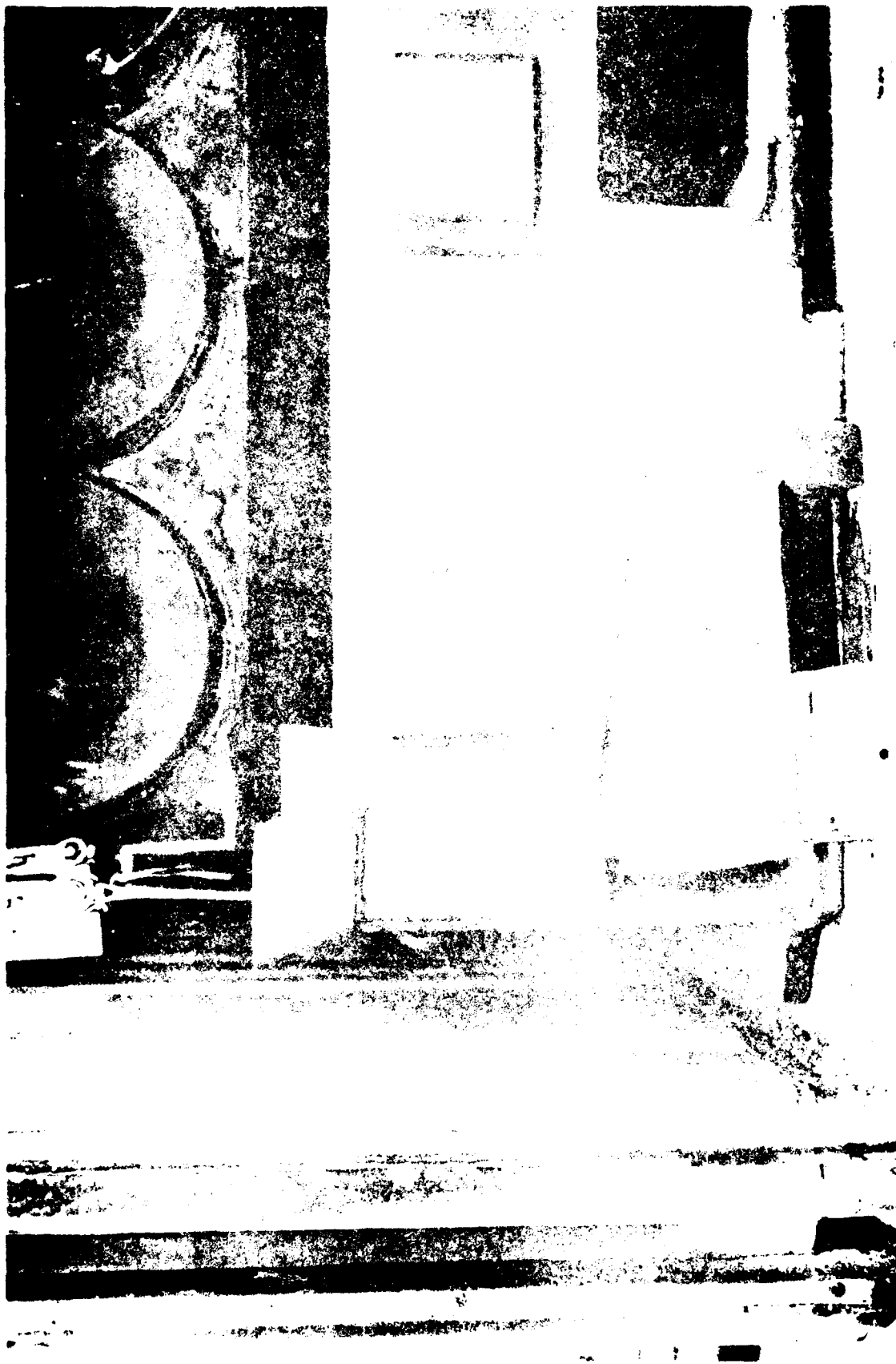
Photo No. 3 This photo shows the ISO container loaded with the LRP and MLRS. The test specimen is being subjected to the road hazard course. The vehicle is driven over the alternately spaced railroad ties at approximately 5 mph.



90-1754

DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

Photo No. 4 This photo shows a special design check that is required to retain the LRP inside the container. Shims are inserted between the checks and LRP for a fit that prevents longitudinal and lateral movement. A second check is placed opposite the one shown. The metal tang on the LRP is a stacking aid for LRPs and interlocks with check installation. A vertical bar on the check butts against the ISO container corner post.



90-1766

DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

Photo No. 5 This photo shows the ERP chest after becoming disengaged while traversing the road hazard course. Note damage to the 4-inch channel steel. The channel steel was probably bent when the ERP slid forward during rail impact testing. The plate in the ERP which contacted the channel steel can be seen in the photo at the left side of the pallet, on the container floor.



90-1563

DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

Photo No. 6 This photo shows a damaged LPP check. Damage was probably caused by collision with a plate mounted to the bottom of the LPP that protruded about four inches from the edge.



60-1571

DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

Photo No. 7 This photo shows the pallet chock with wood spacers to prevent contact with the LRP plate. With the vertical and horizontal shims, both right and left chocks remained intact throughout the rail, road, and STS test sequences.